

SUMMARY

World report on child injury prevention



14099
CLIC -
CPHE

WHO/NMH/VIP08.01

Citation: *World report on child injury prevention: summary*. Geneva, World Health Organization, 2008.

© World Health Organization 2008

All rights reserved. Publications of the World Health Organization can be obtained from WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel.: +41 22 791 3264; fax: +41 22 791 4857; e-mail: bookorders@who.int). Requests for permission to reproduce or translate WHO publications – whether for sale or for noncommercial distribution – should be addressed to WHO Press, at the above address (fax: +41 22 791 4806; e-mail: permissions@who.int).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization or UNICEF concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization or UNICEF in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization and UNICEF to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization or UNICEF be liable for damages arising from its use.

Cover design by INIS.
Design and layout by L'IV Com Sàrl.
Graphics by minimum graphic.
Printed in Switzerland.

World report on child injury prevention: Summary

Acknowledgements

The World Health Organization and UNICEF would like to acknowledge Joanne Vincenten and Morag Mackay from the European Child Safety Alliance who wrote this summary and a set of fact sheets based on the full *World report on child injury prevention*. The latter was developed by more than 180 contributors (editors, lead authors, working group members, regional consultation participants and peer reviewers) from 56 countries around the world. Support and guidance was offered by the report advisors, WHO regional advisors and UNICEF staff. Without the dedication, support and expertise of these people this document would not have been possible.

The *World report on child injury prevention*, the summary and fact sheets also benefited from the contribution of a number of other people, in particular, Tony Kahane who edited the final text of the main report and Angela Burton who edited this summary version. Thanks are also due to the following: Kidist Bartolomeos and Ian Scott for the day-to-day coordination of the project; Mike Linnan for the UNICEF/TASC data analysis; Kidist Bartolomeos, Colin Mathers and Karen Oldenziel for analysis and interpretation of WHO data; Adnan Hyder and Prasanthi Puvanachandra for data analysis from the multicountry study; Laura Sminkey and Steven Lauwers for communication and advocacy; Susan Kaplan for proofreading and Liza Furnival for indexing; Susan Hobbs, L'IV Com Sàrl and Aaron Andrade for graphic design; Pascale Broisin and Frederique Robin-Wahlin for coordinating the printing; and finally, Pascale Lanvers-Casasola for her administrative support and for coordinating the translation of the different versions of this report.

The World Health Organization and UNICEF also wish to thank the following for their generous financial support for the development, translation and publication of the report: the Arab Gulf Programme for United Nations Development Organizations (AGFUND); the Public Health Agency of Canada, the Governments of Belgium, Mexico, the Netherlands, Norway, Sweden, and the United Kingdom; the Global Forum for Health Research; the United States Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.

Foreword

Every day around the world the lives of more than 2000 families are torn apart by the loss of a child to an unintentional injury or so-called “accident” that could have been prevented. The grief that these families suffer – mothers, fathers, siblings, grandparents and friends – is immeasurable and often impacts entire communities. Such tragedy can change lives irrevocably.

Once children reach the age of five years, unintentional injuries are the biggest threat to their survival. Unintentional injuries are also a major cause of disabilities, which can have a long-lasting impact on all facets of children’s lives: relationships, learning and play. Among those children who live in poverty, the burden of injury is highest, as these children are less likely to benefit from the protective measures others may receive.

Child injuries have been neglected for many years, and are largely absent from child survival initiatives presently on the global agenda. Through this *World report on child injury prevention*, the World Health Organization, the United Nations Children’s Fund and many partners have set out to elevate child injury to a priority for the global public health and development communities. The knowledge and experience of nearly two hundred experts from all continents and various sectors were invaluable in grounding the report in the realities faced in many countries.

Children’s maturity and their interests and needs differ from adults. Therefore, simply reproducing injury prevention strategies that are relevant to adults does not adequately protect children. There are proven interventions such as child car seats, cycling helmets, child-resistant packaging for medications, fencing around swimming pools, hot water tap temperature regulation and window guards, to name a few.

Ministries of Health can play a central role in prevention, advocacy and research and in the care and rehabilitation of children with disabilities. Other key sectors include education, transportation, environment and law enforcement.

This *World report on child injury prevention* should be seen as a complement to the *UN Secretary-General’s study on violence against children* released in late 2006. That report addressed violence-related or intentional injuries. Both reports suggest that child injury and violence prevention programmes need to be integrated into child survival and other broad strategies focused on improving the lives of children.

Evidence demonstrates the dramatic successes in child injury prevention in countries which have made a concerted effort. These results make a case for increasing investments in human resources and institutional capacities. This would permit the development, implementation and evaluation of programmes to stem the tide of child injury and enhance the health and well-being of children and their families the world over. Implementing proven interventions could save more than a thousand children’s lives a day.



Margaret Chan
Director-General
World Health Organization



Ann Veneman
Executive Director
United Nations Children’s Fund

The first part of the paper discusses the importance of the study and the objectives of the research. It then proceeds to a literature review, followed by a description of the methodology used. The results of the study are presented in the next section, followed by a discussion of the findings and their implications. The paper concludes with a summary of the main points and a list of references.

The study was conducted in a laboratory setting, using a sample of 100 participants. The participants were divided into two groups, each receiving a different treatment. The results of the study showed that the treatment group performed significantly better than the control group. This finding has important implications for the field of research, as it suggests that the treatment may be effective in improving performance.

The study was limited by several factors, including the sample size and the laboratory setting. Future research should aim to address these limitations by conducting larger-scale studies in more naturalistic settings. Despite these limitations, the study provides valuable insights into the effectiveness of the treatment and its potential applications.

—

—

Author's Name
Institution

Author's Name
Institution

Child injuries in context

Introduction

The landmark Convention on the Rights of the Child, ratified by almost all governments around the world, states that all children have a right to a safe environment and to protection from injury and violence. It further states that the institutions, services and facilities responsible for the care or protection of children should conform with established standards, particularly in the areas of safety and health. Safeguarding these rights everywhere is not easy, but it can be achieved by concerted action. Children are exposed to hazards and risks as they go about their daily lives and are vulnerable everywhere to the same types of injury. However, the physical, social, cultural, political and economic environments in which they live differ greatly. Their particular environments are thus very important.

This Report – targeted at policy-makers – is a summary of the *World report on child injury prevention*¹, which provides a comprehensive review of current knowledge about the various types of unintentional child injuries (road traffic injuries, drowning, burns, falls and poisoning) and how to prevent them.

The overall aims of the main report and this summary are:

- to raise awareness about the magnitude, risk factors and impacts of child injuries globally;
- to draw attention to the preventability of child injuries and present what is known about the effectiveness of intervention strategies;
- to make recommendations that can be implemented by all countries to reduce child injuries effectively.

For the purposes of this report, a child is defined according to the Convention on the Rights of the Child, and thus focuses on injuries occurring in children “under the age of 18 years”. However, some WHO data cannot be disaggregated to under 18 years, and so the category of under 20 years is used instead. For clarity, age ranges are always indicated in tables and figures.

The United Nations Secretary-General's 2006 study on violence against children and the accompanying World report on violence against children provided an in-depth review of intentional injuries to children. In addition, the World report on violence and health included chapters on child abuse, youth violence and sexual violence. This report, consequently, focuses only on unintentional or 'accidental' injuries.

¹ Peden M, Oyegbite K, Ozanne-Smith J, et al, eds. *World report on child injury prevention*. Geneva, World Health Organization and UNICEF, 2008.

JUAN'S STORY

Juan lives with his mother, father, four younger brothers and two younger sisters in a small village outside Merida, in Mexico. Aged 14 years, Juan no longer goes to school, as he has to help his father selling fruit at the roadside. The reason that he left school is related to a terrible accident that the youngest in the family, Martha, suffered 18 months ago.



© WHO

Martha – six years old at the time – had fallen into the water well in the back yard of the family house, while trying to retrieve a toy that she had dropped into it. Juan was the first onto the scene of the incident and had called for his father who was further up the road selling fruit. The two of them ran to the nearest clinic holding Martha, who was limp and not crying. The doctors managed to resuscitate her but she remained in a critical condition and needed to be transferred to a larger hospital in Merida, where she stayed for many weeks.

Juan is still very affected by this incident. He feels responsible for Martha's fall into the well, convinced that it would not have happened if he had been there. At the same time, he is proud to show visitors the wooden construction he and his father made to put over the well, to prevent a similar incident occurring.

Are child injuries a major public health issue?

Injury and violence are a major killer of children throughout the world, responsible for approximately 950 000 deaths in children and young people under the age of 18 years each year. That is more than 100 children dying needlessly every hour of every day. Unintentional injuries account for almost 90% of these cases. Road traffic injuries alone are the leading cause of death among 15–19 year olds and the second leading cause among 5–14 year olds (see Table 1).

Table 1: Leading causes of death in children, both sexes, World, 2004

| Rank | Under 1 year | 1–4 years | 5–9 years | 10–14 years | 15–19 years | Under 20 |
|------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 1 | Perinatal causes | Lower respiratory infections | Lower respiratory infections | Lower respiratory infections | Road traffic injuries | Perinatal causes |
| 2 | Diarrhoeal diseases | Diarrhoeal diseases | Road traffic injuries | Road traffic injuries | Self-inflicted injuries | Lower respiratory infections |
| 3 | Lower respiratory infections | Measles | Malaria | Drowning | Violence | Diarrhoeal diseases |
| 4 | Malaria | Malaria | Diarrhoeal diseases | Malaria | Lower respiratory infections | Malaria |
| 5 | Congenital anomalies | HIV/AIDS | Meningitis | Meningitis | Drowning | Measles |
| 6 | Pertussis | Congenital anomalies | Drowning | HIV/AIDS | Tuberculosis | Congenital anomalies |
| 7 | HIV/AIDS | Protein–energy malnutrition | Protein–energy malnutrition | Tuberculosis | Fire-related burns | HIV/AIDS |
| 8 | Tetanus | Drowning | Measles | Diarrhoeal diseases | HIV/AIDS | Road traffic injuries |
| 9 | Meningitis | Road traffic injuries | Tuberculosis | Protein–energy malnutrition | Leukaemia | Pertussis |
| 10 | Measles | Meningitis | HIV/AIDS | Self-inflicted injuries | Meningitis | Meningitis |
| 11 | Protein–energy malnutrition | Fire-related burns | Fire-related burns | Leukaemia | Maternal haemorrhage | Drowning |
| 12 | Syphilis | Pertussis | Falls | Fire-related burns | Falls | Protein–energy malnutrition |
| 13 | Endocrine disorders | Tuberculosis | Congenital anomalies | War | Poisonings | Tetanus |
| 14 | Tuberculosis | Upper respiratory infections | Epilepsy | Violence | Abortion | Tuberculosis |
| 15 | Upper respiratory infections | Syphilis | Leukaemia | Trypanosomiasis | Epilepsy | Fire-related burns |

Source: WHO (2008), Global Burden of Disease: 2004 update.

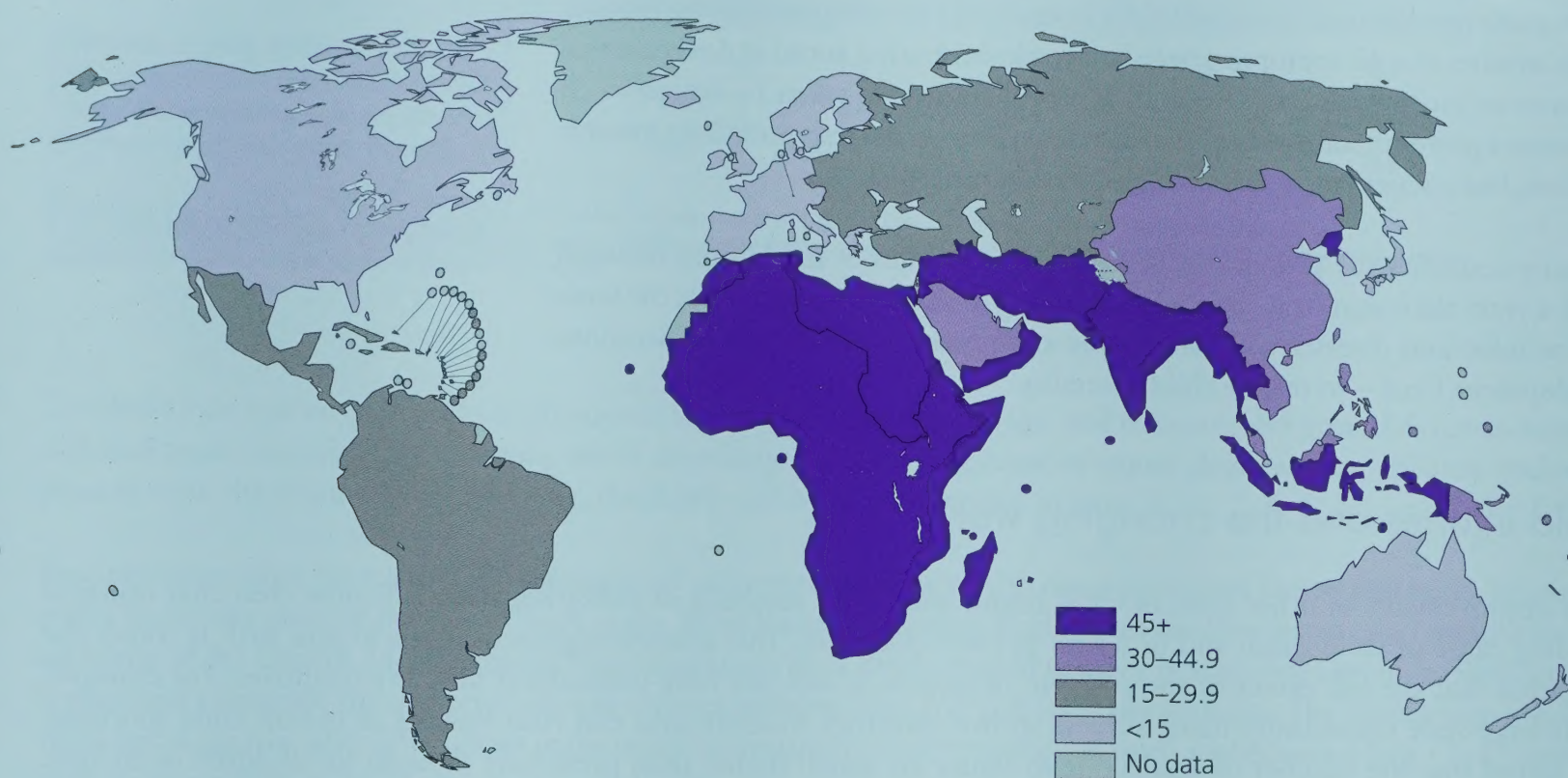
In addition to death from unintentional injury, tens of millions of children require hospital care for non-fatal injuries. Many of these are left with some form of disability, often with lifelong consequences. Road traffic crashes and falls rank within the top 15 causes of disease burden worldwide for children 0–14 years of age. And for injury survivors, the need for care and rehabilitation of the injury and the potential for permanent disability can have far-reaching impacts on their future, their health, education, social inclusion and on their parents' livelihood.

What is an injury?

An injury is defined as “the physical damage that results when a human body is suddenly subjected to energy in amounts that exceed the threshold of physiological tolerance – or else the result of a lack of one or more vital elements, such as oxygen”.

The burden of injury on children is unequal. Children in poorer countries and those from poorer families in better-off countries are the most vulnerable (Figure 1). More than 95% of all injury deaths in children around the world occur in low-income and middle-income countries. Although the child injury death rate is much lower among children from developed countries, injuries are also a major cause of death, accounting for about 40% of all child deaths.

Figure 1: Rate of unintentional injuries per 100 000 children^a, by WHO region and country income level, World, 2004



| Africa | | Americas | | South-East Asia | Europe | | Eastern Mediterranean | | Western Pacific | |
|--------|------|----------|------|-----------------|--------|------|-----------------------|------|-----------------|------|
| LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC |
| 53.1 | 14.4 | 21.8 | 49.0 | 7.9 | 25.4 | 41.6 | 45.7 | 7.8 | 33.8 | |

^a These data refer to those under the age of 20 years. HIC = High-income countries; LMIC = Low-income and middle-income countries. Source: WHO (2008), Global Burden of Disease: 2004 update.

The facts about child injuries

- Approximately 830 000 children under 18 years die every year as a result of an unintentional injury.
- Unintentional injuries are the **leading cause of death** for children over 9 years.
- **Road traffic injuries** and drowning account for nearly half of all unintentional child injuries.
- Tens of millions of children require hospital care every year for non-fatal injuries.
- **Road traffic injuries** and **falls** are the main causes of injury-related child disabilities.
- 95% of child injuries occur in **low-income and middle-income countries**.
- Child injuries remain a problem in **high-income countries**, accounting for 40% of all child deaths.
- Many high-income countries have been able to **reduce** their child injury deaths by **up to 50%** over the past three decades by implementing multisectoral, multipronged approaches to child injury prevention.

How does child injury relate to other child health concerns?

As injury is a leading cause of death and disability among children worldwide, preventing child injury is closely connected to other issues related to children's health. Tackling child injury must be a central part of all initiatives to improve the situation of child mortality and morbidity, and the general well-being of children.

Child survival has been described as "the most pressing moral dilemma of the new millennium" and the Convention on the Rights of the Child, adopted in November 1989, affirms that each child has the right to the highest attainable level of health and to a safe environment. Most countries in the world have ratified this convention, which requires that all appropriate legislative, administrative, social and educational measures to protect the child from all forms of injury are taken by countries. It represents a powerful statement of the collective views on the responsibilities towards children, but a statement is not enough – action is needed.

In many countries the proportion of deaths due to injuries in children between 1 and 4 years old is significant enough that failing to address the injuries at the same time as infectious diseases will hamper the attainment of the fourth Millennium Development Goal – to reduce child mortality.

"If we are ultimately going to meet the Millennium Development Goal to reduce child mortality, it is imperative that we take action to address the causes of childhood injury."

*Anupama Rao Singh
Regional Director of UNICEF, East Asia and Pacific*

Child injuries and the changing world

With improvements in other areas of child health and better methods of collecting data, it is now clear that injury is a leading cause of child death and ill health in most countries. This acknowledgement is recent and with it comes the realization that the full extent of the problem of injuries is still not fully understood in many countries. For example, recent large-scale community-based surveys in five countries in south and east Asia looking at overall child mortality have found that the number of deaths due to injury are much higher than previously thought for children of all ages. Further issues such as globalization, urbanization, motorization and environmental change all have the potential to make the problem worse.

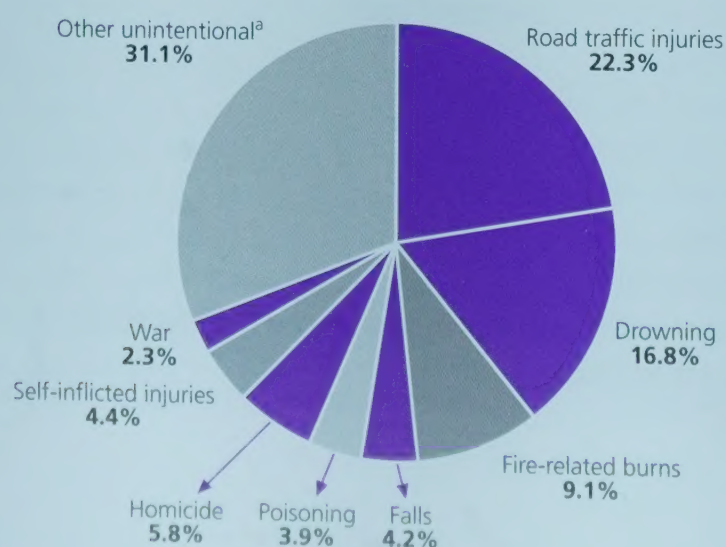
What are the patterns of child injury?

Child injuries vary by cause, severity, age of the child and where they live, all of which should be taken into account when planning action.

Fatal child injuries

The majority of the fatal injuries to children under the age of 18 years in 2004 were the result of road traffic collisions, drowning, fire-related burns, falls or poisoning. These five categories made up 60% of all child injury deaths (Figure 2).

Figure 2: Distribution of global child injury deaths by cause, 0–17 years, World, 2004



^a 'Other unintentional' includes categories such as smothering, asphyxiation, choking, animal and venomous bites, hypothermia and hyperthermia as well as natural disasters.
Source: WHO (2008), Global Burden of Disease: 2004 update.

The rate of child injury death is more than three times higher in low-income and middle-income countries than in high-income countries, but there are large variations according to the category of injury death. For fire and flame deaths, the rate in low-income countries is close to eleven times higher than in high-income countries, for drowning it is six times higher, falls is around five times higher and poisons four times higher (Table 2).

Table 2: Unintentional injury death rates per 100 000 children^a by cause and country income level, World, 2004

| | UNINTENTIONAL INJURIES | | | | | |
|-------|------------------------|----------|------------|-------|---------|--------------------|
| | Road traffic | Drowning | Fire burns | Falls | Poisons | Other ^b |
| HIC | 7.0 | 1.2 | 0.4 | 0.4 | 0.5 | 2.6 |
| LMIC | 11.1 | 7.8 | 4.3 | 2.1 | 2.0 | 14.4 |
| World | 10.7 | 7.2 | 3.9 | 1.9 | 1.8 | 13.3 |

^a These data refer to those under the age of 20 years. HIC = High-income countries; LMIC = Low-income and middle-income countries.

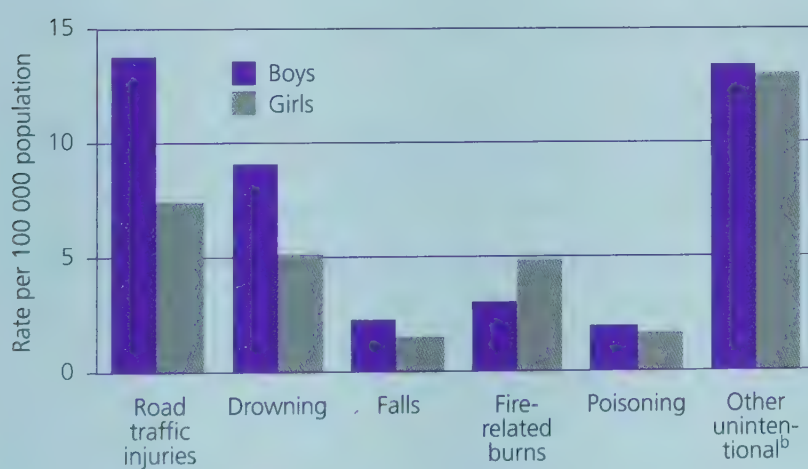
^b 'Other' includes categories such as smothering, asphyxiation, choking, animal and venomous bites, hypothermia and hyperthermia as well as natural disasters.

Source: WHO (2008), Global Burden of Disease: 2004 update.

The death rate and categories of unintentional injury death also vary by age, and there are also great differences between rich and poor countries. For example, while drowning is the leading cause of injury death among children under five years in both the United States and Asia, the death rate is 30 times higher in Asia.

Boys die more often than girls in all categories of unintentional injury, with the exception of fire-related burns (Figure 3), where in certain parts of the world, such as the WHO South-East Asia Region and the low-income and middle-income countries of the Eastern Mediterranean Region, teenage girls' deaths exceed those of teenage boys by up to 50%. In most regions and countries, the difference in fatal injuries between boys and girls increases with age. The proportions are about equal up to age five, after which boys make up an increasingly greater proportion until adolescence when 15–17-year-old boys make up 86% of unintentional injury deaths.

Figure 3: Unintentional injury death rates per 100 000 children^a by cause and sex, World, 2004



^a These data refer to those under the age of 20 years.

^b 'Other' includes categories such as smothering, asphyxiation, choking, animal and venomous bites, hypothermia and hyperthermia as well as natural disasters.

Source: WHO (2008), Global Burden of Disease: 2004 update.

Non-fatal child injuries and disability

Deaths from injury are just the tip of the iceberg and the causes of injury associated with child deaths are different from the causes of non-fatal injury and disability (see Figure 4 which illustrates the injury pyramid for fall-related injuries in children). It is therefore important to look beyond injury deaths, because focusing on deaths alone may result in injury prevention strategies that ignore frequent non-fatal injuries that are costly to the health-care system.

Head injuries are the single most common – and potentially most severe – type of injury that children suffer. Among minor injuries incurred by children, cuts and bruises are those seen most frequently. However, the most common category of unintentional injuries requiring hospital admission of children under 15 years are fractures to the arms and legs.

Data from the Global Childhood Unintentional Injury

Surveillance study conducted in four countries – Bangladesh, Colombia, Egypt and Pakistan – showed that nearly half the children under the age of 12 years who had suffered an unintentional injury severe enough to require treatment at an emergency room were left with some form of disability. Among children who had suffered a burn, 8% were left with permanent disabilities, while children injured in traffic crashes were even more likely to be left with some form of disability. Many children who survive major trauma are left with ongoing physical, mental or psychological disabilities, with a major impact on their own lives as well as on the lives of their families. Further children are not only affected by injuries to themselves, but also by injury to others. This is particularly true when an injury to a parent or caregiver results in death or disability and subsequent loss of family income.

Despite the enormity of the injury issue, tackling the problem is possible. Experience and research in high-income countries have shown that most child injuries, and deaths from injuries, are preventable, and much of that knowledge can be applied in all countries.

What makes children particularly susceptible to injury?

Children are not small adults. Their abilities and behaviour differ from those of adults. Children's physical and mental abilities, degree of dependence, type of activities and risk-taking behaviours all change substantially as they grow older. But as children develop, their curiosity and need to experiment do not always match their ability to understand or to respond to danger, leaving them at risk of injury. Children's injuries are thus highly related to the type of activities they undertake, and this in turn is related to their age and stage of development.

Age and developmental issues

Child injury deaths and non-fatal injuries vary substantially by age. It is important that injury prevention strategies take into account child age and developmental stages, and also the reality of our changing world. For example, the situation in parts of sub-Saharan Africa where HIV and AIDS are creating parentless households and forcing young children to take on adult responsibilities, demonstrates that the nature of childhood has changed radically.

A number of physical characteristics make children vulnerable to injuries. Their small size increases their risk in a road environment. They are less visible than adults and if hit by a vehicle, they are more likely than an adult to sustain a head or neck injury. At the same time, small children have difficulty seeing over vehicles, judging the speed of oncoming vehicles and judging the distance of a vehicle from the sound of its engine. Infants' skin burns deeper, quicker and at lower temperatures than the thicker skin of adults. In addition, certain physical characteristics of young children may affect injury outcomes. For example, a particular amount of a poisonous substance will more likely be toxic for a child than an adult because of the child's smaller body mass. Children's smaller size also creates a risk of entrapment of body parts, most dangerously for the head. Many products and settings do not adequately take these risks into account.

Figure 4: Injury pyramid for fall-related injuries among children 0–17 years, Jiangxi province, China



Studies of children in road traffic have shown that young children may lack the knowledge, skills and levels of concentration needed to manage the road environment, no matter how calm the road conditions. Further children's physical abilities may not be matched by mental abilities. Young children in the process of exploring their world, for instance, may fall from heights because their climbing ability is not matched by their ability to balance or reason.

Gender

Boys tend to have both more frequent and more severe injuries than girls and various theories have been proposed for the difference in injury rates between boys and girls. These include the idea that boys engage in more risk taking than girls, that they have higher activity levels, and that they behave more impulsively. Also included are the suggestions that boys are socialized in a different way from girls. They are less likely to have their exploration restrained by parents, are more likely to be allowed to roam further, and are more likely to be allowed to play alone.

Poverty

Children in poorer countries and those in less well-off families in richer countries are at increased risk of injury. A broad range of socioeconomic factors affects their injury risk. Factors include family income, maternal education, single parenting, maternal age, number of children, number of household occupants, type of housing and level of overcrowding. Children living in poverty are more likely to be exposed to hazardous environments including high-volume, fast-moving traffic, lack of space and facilities for safe play, cramped living conditions with no proper kitchen, open cooking fires, unprotected windows and open roofs, and stairs without handrails.

In addition injuries can also cause poverty, starting a vicious cycle. Poor populations are particularly vulnerable to crises brought about by a road traffic crash or a flood, which can trigger a further decline in family resources. Children are a particularly vulnerable group, either directly through being injured themselves or indirectly through the loss of their parents. In Bangladesh, for example, a study found that injury was the leading cause of children losing a parent, with about 7900 fathers and 4300 mothers dying each year.

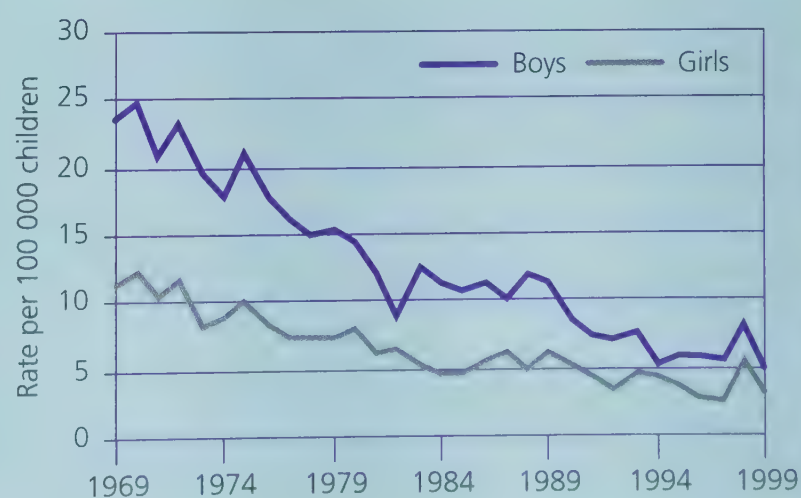
Environment

Children's physical and mental stages, age and gender are important, but children are especially vulnerable to injury because they live in a world in which they have little power or control. This is further complicated by children's lack of ability to change their environment. Children live in urban and rural environments constructed by and for adults. Their voices are seldom heard and only rarely are places designed in consultation with them. Urban planners and policy-makers often assume that changes will benefit all without taking into account children's concerns. New products are often designed without taking into consideration their possible uses by children and the consequent harm. Children's needs must be incorporated into their living environments.

Injuries can be prevented

Injuries can be prevented or controlled. A number of high-income countries have achieved remarkable reductions in their child injury death rates, in some cases by more than 50% (see Figure 5). However, that success was not the result of simply reproducing safety strategies that are relevant to adults. The unique, real needs of children can be addressed by the basic principles that underlie most of the successful injury prevention programmes around the world.

Figure 5: Trends in child injuries, Sweden, 1969–1999



Which approaches work?

Countries that use a combination of broad approaches, in addition to encouraging a culture of safety and displaying strong political commitment, have made the greatest progress in reducing their child injury burden. Each of the broad approaches has been applied in different child injury areas and specific prevention strategies have been developed, many of which have proven to be effective in reducing injuries, or show great promise.

Approaches to child injury prevention

- Legislation and enforcement
- Product modification
- Environmental modification
- Supportive home visits and promotion of safety devices
- Education, skills development and behaviour change
- Community-based projects
- Prehospital and acute care, as well as rehabilitation

Legislation and enforcement

Legislation is a powerful tool in the prevention of injury. It can be regarded as a “test of commitment to the cause of child safety”. There is evidence that legislation has increased the uptake of preventive measures and reduced childhood injuries in a number of areas. Many countries have specific standards or regulations for a wide range of goods and services, such as childcare products and helmets, and there are also usually regulations and standards related to the construction of buildings as well as for health and safety in the workplace in general. For example, legislation setting lower blood alcohol levels for young drivers has led to a 4% reduction in crashes and significant reductions in poisonings have been achieved in high-income countries through laws requiring child-resistant packaging of poisons. However as well as the introduction of new laws, how consistently they are applied and how rigorously they are enforced are important.

Product modification

Changing the design and manufacture of products can reduce the risk of an injury, reduce access to a hazard or reduce the severity of an injury. Product modification has contributed to preventing childhood injuries. For instance, the introduction of child-resistant closures has been effective in reducing the number of childhood deaths from poisoning from substances such as paraffin, household products, and chemicals while the redesigning of wood-burning stoves has the potential to reduce not only acute lower respiratory tract infections in children, but also burns and scalds.

“Adapting the environment to the characteristics of children and integrating safety into the design of products are among the most successful child injury prevention strategies.”

Wim Rogmans
Director, Consumer Safety Institute

Environmental modification

Modifying the environment to make it more user-friendly is an important approach in injury prevention. Effective environmental modifications have been developed for the road traffic environment and the home. For example, high-income countries have made considerable progress in making the transport infrastructure safer, including around schools and kindergartens. While not all of these options may work in low-income countries, one option showing promise is the physical separation of different types of road user. In Malaysia, for example, separate lanes for motorcyclists have resulted in crash reductions of 27%.

Supportive home visits

Home visiting by paediatric nurses to families at high risk of injury has been used for a wide range of purposes, including improving the home environment, family development and addressing child behaviour. Improvement in the quality of the home environment is associated with a reduced risk of some types of injury, for example falls in very young children, with the greatest impacts found in programmes using professional visitors with longer visitation schedules and those supplying and explaining safety devices.

Safety devices

The development and promotion of safety devices can lead to important reductions in injuries. For example, bicycle helmets reduce the risk of head and severe brain injury among cyclists of all ages by 63–88% while smoke detectors reduce the risk of fire-related deaths by 70%.

Education, skills and behaviour change

Clearly, education underpins other strategies such as legislation, the promotion of safety devices and home visiting. However, educational programmes *on their own* have not been shown to reduce injuries and should not be the only focus of child injury prevention efforts, particularly when other proven and promising strategies exist.

Emergency medical care

Strengthening trauma care services across the spectrum, from pre-hospital care through hospital care to rehabilitation, will do much to lower the burden of death and disability from injury. Pre-hospital and hospital care can be improved by standardizing equipment, training, infrastructure and operations, and where there are no formal emergency medical services, pre-hospital care can be improved by building upon existing, informal systems and transport.

Cost and cost-effectiveness

For many parents, the grief of unexpectedly losing a child to an injury can take decades to heal and for many it never does. For some families the emotional pain is even greater when they realise simple measures could have prevented the incident. Even when the outcome of an injury is not fatal, the medical costs and the special care that are often needed for a severely injured or disabled child can put a huge financial demand on parents, and cause great difficulties for families or caretakers.

In addition to what parents, siblings, families and communities have to endure, child injuries also place a significant strain on often overstretched health-care systems. The cost of primary prevention programmes is much cheaper than treating a child, sometimes for months, because of a preventable injury. Many wealthy countries have already implemented cost-effective primary prevention programmes that have led to reductions in health-care costs. In the United States, for instance, it has been estimated that for every US\$ 1 spent on a child restraint, there is a saving of US\$ 29 in direct and indirect health-care costs, and other costs to society. As can be seen from Table 3, many cost-effective strategies for unintentional injury can save not only lives but costs to society as well. If similarly effective interventions to prevent child injury were implemented around the world, more than 1000 children's lives could be saved each day.

Table 3: Financial savings from selected injury prevention interventions

| EXPENDITURE OF US\$1 EACH ON | SAVING (US\$) |
|--|---------------|
| Smoke alarms | 65 |
| Child restraints | 29 |
| Bicycle helmets | 29 |
| Prevention counselling by paediatricians | 10 |
| Poison control services | 7 |
| Road safety improvements | 3 |

The financial cost of injuries to governments is enormous. In developing countries, road traffic injuries alone account for 1%–2% of gross domestic product (about US\$ 100 billion) each year, or twice the total development aid received worldwide by developing countries. While there are no global data on the cost of unintentional child injuries, a recent evaluation in the United States has shown that the medical costs and losses in productivity as a result of all injuries to 0–14 year olds are in the range of US\$ 50 billion annually. There is thus a great need for cost-effective and well targeted actions.

“We cannot accept these injuries as just accidents that will happen. If a disease were killing our children at the rate that unintentional injuries are, the public would be unbelievably outraged and demand that this killer be stopped.”

*C. Everett Koop
Former United States Surgeon General, 2001*

A number of prevention strategies have been proven to work and can be cost-effective as well. However, effective devices need to be available and affordably priced so they are accessible to families, especially in low-income and middle-income countries. Data from 18 economically diverse countries have been compared for four effective devices: child safety seats, booster seats, child bicycle helmets and smoke alarms. The prices of these devices varied widely and in many countries they were very expensive. A factory worker in a low-income country had to work 11 times as long as a counterpart in a high-income country to buy a bicycle helmet, while for a child safety seat 16 times as many hours' work were required.

Cost and cost-effectiveness analyses of prevention strategies to reduce or mitigate child injuries are urgently needed. Such evidence can have a strong impact on policy-makers and persuade them to invest in the appropriate primary prevention interventions.

Overcoming the obstacles

“Evidence on its own does not provide a complete recipe for success, or an imperative for action”. The findings of research need to be translated into practice, so that they are tailored to local contexts and circumstances. In areas of the world where substantial progress has already been made, efforts are required to apply effective interventions more widely. For example, a recent analysis conducted in the United States showed that child injury deaths could be reduced by one third if practices that had proven effective in certain States were adopted in other, similar States. In areas where activity is just beginning, interventions should be prioritized after considering the scale of the problem, and the known effectiveness and cost-effectiveness or cost of each intervention (where available) within the context of the country. Unfortunately, child injury prevention is complicated by a number of fallacies, limitations and other obstacles, but none is insurmountable.

Conclusion

Despite the many and complex obstacles, injury prevention nevertheless offers opportunities. The public health significance of road traffic injury and of violence has increasingly been recognized in recent years. There has been much experience and understanding developed on all aspects of injury prevention. These developments can create a strong basis to bring about significant and sustainable reductions in child mortality and ill-health throughout the world.

Child survival initiatives have been highly successful. At the beginning of the “child survival revolution”, more than 75% of the world’s children lived in countries where child mortality was high – while now, only thirty years later, less than 20% of children do so. Further improvements in child health, though, will require broad programmes for injury reduction and control for children up to the age of 18 years.

Now is the right time to address this avoidable harm to children and to society. Every child lost to injury or severely disabled will cost the future economy of that country. Putting into practice what is known about reducing child injury will help meet the Millennium Development Goals. It will reduce costs in the health care system, improve the capacity to make further reductions in injury rates, and will protect children.

Challenges in child injury prevention

- Injuries are still thought to be due to fate
- Few countries have good descriptive data on child injury
- Limited evaluation of “what works” in low-income and middle-income countries
- Limited human capacity to address the issue
- Poor collaboration between agencies to address child injuries in a coherent manner
- Lack of funding to support prevention efforts
- Lack of political commitment and understanding

Counting child injuries

The Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) is an example of an emergency department-based child injury surveillance programme. It has been in operation since 1990 and collects information about the circumstances in which injuries occur as well as the type and severity of the injuries sustained.

Over the last 18 years CHIRPP has produced many reports on a wide range of injury issues such as the impact of legislation on bicycle helmet use; the effect of new regulations allowing body-checking in younger ice-hockey players; and the impact of new Canadian standards for playground equipment. Most notably, CHIRPP’s report on injuries sustained by children as a result of baby walkers led to Health Canada’s Product Safety Bureau deciding that baby walkers posed significant and unnecessary risks to young children. This led in turn, in June 2007, to Canada’s Minister of Health upholding an earlier prohibition on baby walkers, including their advertising, sale and importing. Canada remains the only country in the world to date to ban all types of baby walkers.



© P. Lanvers-Casasola, WHO

Road traffic injuries

As children grow and their lives extend beyond their home and out onto local roads, they meet with hazards and risks. Despite the fact that children use the road as pedestrians, bicyclists, motorcyclists and occupants of vehicles, in many countries the road environment is not developed with their needs in mind. In some countries children even work, play or live on the roads. This exposure, along with other risk factors inherent to childhood, make children more vulnerable in traffic.

The magnitude of road traffic injuries

What is a road traffic crash?

A road traffic crash is defined as a collision or incident occurring on a public road involving at least one moving vehicle, and a road traffic injury is defined as a fatal or non-fatal injury that results from a road traffic crash.

Road traffic injuries are the leading cause of death among 10-19 year olds.

More than 260 000 children die as the result of road traffic crashes each year, and it is estimated that up to 10 million more are non-fatally injured. The global cost of road traffic injuries and deaths has been estimated at US\$ 518 billion annually, or about 3% of the gross national product of most countries. Children who are victims of road traffic injuries are not the only ones who suffer, as demonstrated in South-East Asia where 20–66% of orphans lost one or more parents in a road crash.

Ninety-three per cent of child road traffic deaths occur in low-income and middle-income countries. About two-thirds of child road traffic injury deaths occur in the South-East Asian and African regions as well as the low-income and middle-income countries of the Western Pacific Region although the Africa and the Eastern Mediterranean Regions have the highest fatality rates (Table 4). Even in the European Union countries, where rates are not as high, road traffic injuries still account for 1 in 5 childhood injury deaths.

DEANA'S STORY

Deana is my daughter. She was 17 years old when her life was cut short. She and three friends were going to a birthday party. They had just got out of the taxi and were crossing a road with heavy traffic, where there were no traffic lights or crosswalks, when she was hit and killed by a speeding bus. Deana loved so many things, she loved life. She always had more time for other people than for herself. For us, she has become the 'angel of the Nile'.

A nongovernmental organization, the Safe Road Society, started because our daughter lost her life. It is dedicated to making the roads in Egypt safer for its citizens. Our first project is the building of a pedestrian tunnel under the Maadi Corniche El Nile which is where Deana died. This busy road of death runs alongside the serenity of the Nile River. Many concerned and dedicated Egyptians and foreigners have joined together with the goal to make the tunnel a reality. Governmental permits have been obtained and request for construction bids sent. Our next step is to ensure sufficient funds are raised through voluntary donations to complete this life-saving project. Also, a scholarship was started in Deana's name at her school and every year a graduating senior who smiles and brings light to another student's day is awarded a helping hand. By building a pedestrian tunnel we hope to save lives and, in my dreams, to see my Deana, my Angel of the Nile, looking down upon us and smiling in approval.

David Blanchard, Deana's father



© D. Blanchard

Table 4: Road traffic injury mortality rates per 100 000 children^a by sex, WHO region and country income level, 2004

| | South-East Asia | | South-East Asia | | Europe & Central Asia | | Americas & Eastern Mediterranean | | Western Pacific | |
|------------|-----------------|------|-----------------|-----|-----------------------|------|----------------------------------|------|-----------------|------|
| | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC |
| Boys | 23.9 | 10.8 | 10.5 | 9.6 | 7.4 | 11.2 | 27.8 | 22.3 | 5.8 | 12.2 |
| Girls | 15.9 | 6.5 | 4.8 | 5.1 | 2.8 | 5.3 | 8.6 | 12.2 | 2.5 | 4.7 |
| Both sexes | 19.9 | 8.7 | 7.7 | 7.4 | 5.2 | 8.3 | 18.3 | 17.4 | 4.2 | 8.6 |

^a These data refer to those under 20 years of age.

HIC = High-income countries; LMIC = Low-income and middle-income countries.

Source: WHO (2008), Global Burden of Disease: 2004 update.

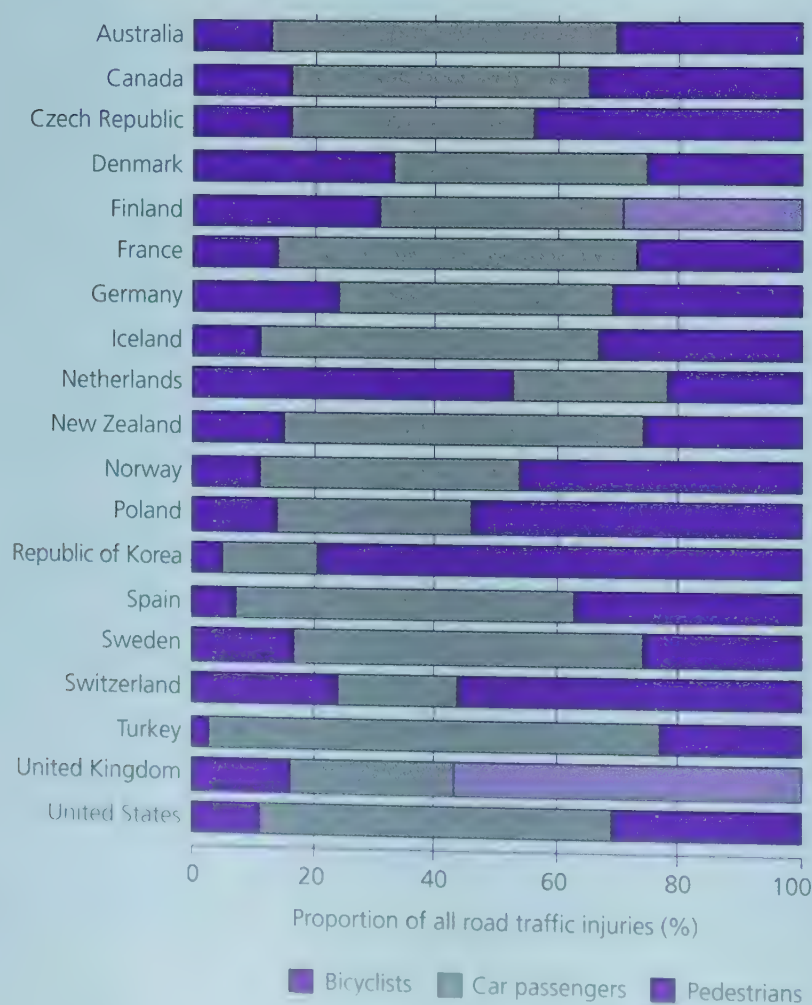
In most regions worldwide, at least twice as many boys are killed in road traffic crashes than girls, and children aged 15–19 years are at greatest risk (Table 5).

Table 5: Fatal road traffic injury rates per 100 000 children by age and sex, World, 2004

| | AGE RANGES (IN YEARS) | | | | | |
|------------|-----------------------|-----|------|-------|-------|----------|
| | Under 1 | 1–4 | 5–9 | 10–14 | 15–19 | Under 20 |
| Boys | 11.5 | 9.7 | 13.3 | 8.7 | 23.4 | 13.8 |
| Girls | 7.4 | 8.3 | 9.3 | 4.5 | 7.9 | 7.5 |
| Both sexes | 9.5 | 9.0 | 11.4 | 6.6 | 15.9 | 10.7 |

Source: WHO (2008), Global Burden of Disease: 2004 update.

Children are killed or injured as pedestrians, cyclists, car occupants, motorcycle riders or passengers, or users of public transport such as public or school buses (Figure 6). Added to this, in many countries children live, play or are forced to work on the streets.

Figure 6: Proportion of fatal road traffic deaths among children^a by type of road user in selected OECD countries

^a These data refer to those under 15 years of age.

OECD = Organisation for Economic Co-operation and Development.

Why are children at risk of road traffic injuries?

Children are at risk of road traffic injuries for a variety of reasons. Identifying and understanding the factors that put children in danger of a road traffic crash or injury will assist greatly in their prevention.

Age and developmental stage

Globally children's risk of a road traffic injury increases with age from birth, reflecting both increasing exposure and differences in the way children of different ages use the road. For example younger children are more likely to be accompanied by parents during travel while older children begin to get around more independently first on foot, then bicycle, motorcycle and eventually as drivers. Risks relate to their physical and cognitive development, risk-taking behaviour and peer pressure.

Physical development

Children are more physically vulnerable to the impact of an injury than an adult because their smaller size can limit their ability to see or be seen in the traffic environment, and their less-developed sensory abilities result in them missing critical cues to danger, thereby increasing their risk.

Cognitive development

Children's level of cognitive development also impacts their ability to make safe decisions on the road. Many of the concepts required to move safely in traffic, such as speed and distance, are not mastered until children are 5–7 years of age and they cannot reliably identify dangerous situations in traffic until they are aged 11 years. Adolescents' capacity to reason, make judgements or decisions and their impulse control are not fully mature until after they reach 20 years, putting them at increased risk as young drivers.

Risk-taking behaviour

Older children and adolescents may actively seek out risk to feel a sense of control or sometimes to oppose authority. Sensation seeking has been shown to rise between 9 to 14 years, peaking in late adolescence and is a significant predictor of road traffic injury for pedestrians and young drivers.

Peer influence

Young drivers experience higher peer pressure to commit violations such as speeding, driving under the influence of alcohol or dangerous overtaking than older drivers, particularly in the presence of similarly aged passengers.

Gender

Boys are at greater risk of road traffic injuries than girls relating to differences in exposure, risk-taking behaviour and sensation seeking.

Road users

Pedestrians

Children as pedestrians are at risk because their physical and cognitive development and smaller size reduce their ability to make safe decisions on the road. In many low-income and middle-income countries children also have increased exposure because the road is used for play and work.

Occupants

Children as motor vehicle occupants are at risk if unrestrained or incorrectly restrained. Prevalence of appropriate restraint use varies from nearly 90% in the United States of America to almost no usage in many low-income and middle-income countries. Teenagers and young adults have the lowest seat-belt wearing rates around the world.

Cyclists or motorcyclists

The risk for children as cyclists relates directly to exposure. In most high-income countries where cycling is done for pleasure, rates are low, however, in many low-income and middle-income countries they are considerably higher – by up to one third. Other risks include lack of a correctly worn helmet, riding in mixed traffic, cycling on pavements or footpaths and cyclist visibility.

The risk for children as motorcycle riders or passengers also relates directly to exposure, with many children riding as passengers and many countries allowing adolescents to drive motorcycles from the age of 15 years. The correct use of helmets among motorcyclists and their pillion passengers is low in many countries and is a significant risk for head injuries in the event of a crash.

Drivers

Teenage drivers are a special risk group. Per distance driven, 16-year-old drivers are more than twice as likely as drivers 20–24 years and 4 times as likely as drivers 25–29 years to be involved in a fatal crash. New drivers aged 16–19 years also have more crashes than older new drivers with the same amount of driving experience. They are not only more likely to drink and drive but are also more susceptible to the impact of alcohol on their driving. Additional risk factors include increased likelihood to speed, to fail to wear a seat-belt, to use a mobile phone or other distracting device, to be tired while driving or to violate traffic rules.

Poverty

There is a strong association between socioeconomic status and child road traffic injury. In high-income countries the risk for children and young adults is higher if they come from families of a lower social class. In one low-income country choice of transport used was found to relate to family income, which in turn may increase risk. In another country family size was associated with risk of pedestrian injury in children.

Vehicle design

Vehicle design is an important risk factor for child road traffic injury given a child's small stature. It can affect the probability and severity of injuries sustained by a child pedestrian. Bumpers in particular are being redesigned to reduce head injuries in child pedestrians. Many vehicles are also now being fitted with reverse sensors to reduce 'back-over' injuries of young children in driveways or parking lots. Ergonomic changes to bicycle design can also lead to reduced risk of injury

The road environment

A number of road environment factors increase the risk of children in road systems. Child pedestrians are at particular risk when:

- traffic volume exceeds 15 000 motor vehicles per day
- there is no safe and efficient public transport system
- vehicles travel at inappropriate speed
- poor land use and road networking lead to a lack of playgrounds and a lack of separation of road users
- long, straight roads encourage increased speed in areas with mixed land use including housing, schools and commercial outlets.

Lack of access to treatment and rehabilitation

The availability, affordability and quality of trauma care all have an impact on recovery from a road traffic injury. These services are either not available or of limited scope in many low-income and middle-income countries, leading to many children failing to receive medical care.

The need for a less intimidating environment in emergency care settings

A study in the United Kingdom found that a visit to the accident and emergency department after a road crash is often a young person's first encounter with a hospital. This experience can add to their physical distress because of a lack of information, a lack of understanding and feelings of exclusion or loneliness.

When treating a young road traffic victim, health personnel should provide more information, communicating it in a manner appropriate for young people, and try to offer an environment that is less intimidating.

What can be done to prevent road traffic injuries?

Much has been written over the past decade about how best to reduce the incidence of road traffic injuries. *The World report on road traffic injury prevention* describes proven interventions and makes six recommendations to prevent road traffic injuries at country level. Promoting the systems approach, the report’s recommendations are equally applicable to the prevention of road traffic crashes involving children.

The systems approach is of particular value in child road safety because it moves away from placing the onus on children to adapt their behaviour to cope with traffic, to recognizing that children’s need for safe mobility must instead be addressed in the design and management of the whole transport system. There are a number of interventions, though, that focus specifically on children (see Table 6).

What is the systems approach to road safety?

Making a road traffic system less hazardous requires understanding the system as a whole, understanding the interaction between its elements – vehicles, roads, road users and their physical, social and economic environments – and identifying where there is potential for intervention.

Table 6: Summary of proven strategies to prevent road traffic injuries among children

| STRATEGY | EFFECTIVE |
|--|-----------|
| Introducing (and enforcing) minimum drinking-age limits | ✓ |
| Setting (and enforcing) lower blood alcohol concentration limits for novice drivers and zero tolerance for offenders | ✓ |
| Utilizing appropriate child restraints and seat-belts | ✓ |
| Wearing motorcycle and bicycle helmets | ✓ |
| Forcing a reduction of speed around schools, residential areas, play areas | ✓ |
| Separating different types of road user | ✓ |
| Introducing (and enforcing) daytime running lights for motorcycles | ✓ |
| Introducing graduated driver licensing systems | ✓ |

Engineering and urban planning approaches

- Establish reduced speed limits for vehicles around schools, residential and play areas. Survival of pedestrians and cyclists is much greater at collision speeds below 30 km/h so traffic calming measures that use engineering measures such as speed humps, visual changes such as road surface treatments, or the redistribution of traffic (such as one way streets around schools) to slow down vehicles through residential and school areas should be encouraged
- Establish infrastructure to separate road users. The risk to child cyclists or motorcyclists can be reduced by physically separating them using barriers or kerbs, or visual cues. Cycling lanes have been shown to reduce the risk of injury by 4% and exclusive motorcycle lanes in Malaysia have resulted in crash reductions of 27%.

Vehicle design and safety equipment

- Establish and enforce daytime running lights to increase visibility of motorcyclists. This strategy has been shown to be effective in reducing fatalities in countries where motorcycles are a common mode of transport.
- Encourage the use of protective equipment in vehicles such as child passenger restraint systems, booster seats and seat-belts, and a rear seating position for children. In the event of a crash, correctly installed and used child restraint systems can reduce deaths among infants by about 70%, deaths among small children aged 1–4 years by 54%, and for children aged 4–7 years, booster seats reduce significant clinical injuries by 59% over seat-belt use alone For children over 10 years or taller than 150 cm, normal seat-belts, that reduce the risk of being ejected and suffering serious or fatal injury by 40–65%, should be used.
- Encourage the use of helmets for bicycles and motorcycles. Bicycle helmets reduce the risk of head and brain injury among cyclists of all ages by 63–88% and are particularly important for children because of their increased exposure to traffic. Similarly motorcycle helmets protect the head in the event of a crash, decrease the risk and severity of injuries by about 72% and the risk of death by up to 39%. Helmets are the single most effective way of reducing head injuries and deaths resulting from motorcycle crashes.

Legislation and standards

- Establish and enforce minimum legal drinking age laws for alcohol. These laws specify the age below which purchase or public consumption of alcohol is illegal. Evidence from the United States of America suggests that a minimum drinking age of 21 years has reduced drinking, driving after drinking and alcohol-related crashes among youth.

- Establish and enforce lower legal blood alcohol concentration levels for novice drivers and zero tolerance for offenders of all ages. Many countries have set a lower blood alcohol limit (usually between zero and 0.02 g/dl) for young drivers under 21 years of age, and this strategy has been shown to lead to reductions in crashes of 4%–24% among such novice drivers.
- Establish and enforce graduated driver licensing systems. These systems, which typically place restrictions on new drivers for their first two years of driving, have shown to reduce crashes and fatalities significantly with estimates of effectiveness from 4%–60%. The single most effective provision is the extension of the learner period which delays unsupervised driving.
- Establish and enforce the use of protective equipment in vehicles such as child passenger restraint systems, booster seats and seat-belts, and a rear seating position for children.
- Establish and enforce helmet laws requiring use by all ages. To be most effective, helmet wearing laws should include pillion passengers so that child motorcycle passengers are included.

Education and skill development

- Increase compliance with the use of protective equipment in vehicles such as child passenger restraint systems, booster seats, seat-belts and a rear seating position for children through public awareness campaigns, and strategies addressing issues of access and affordability.
- Increase compliance with use of helmets by cyclists, motorcyclists and their passengers through public awareness campaigns and strategies addressing access and affordability.

What needs more evidence or should be avoided?

- Although they have proven benefits for adults, **airbags** impose serious risks to children under the age of 13 years and children should not sit in the front passenger seat of cars with airbags unless there is no alternative, or the airbag has been deactivated. Further, a rear-facing child safety seat should never be placed in front of an airbag.
- **Driver education** has not been found to be an effective way to reduce road traffic injuries and there is some evidence that this strategy may increase road traffic crashes, because it leads to younger drivers on the road.
- Given the evidence of the many increased risks of road traffic injuries for young drivers, **early licensing of teenage drivers** without a graduated licensing system is not recommended.

Getting helmets on children's heads: the Viet Nam experience

Since 1999, the Asia Injury Prevention Foundation has worked to increase helmet wearing rates and decrease child road traffic casualties in Viet Nam. They used a combination of strategies including public awareness campaigns, government lobbying, development of helmet standards for adults and children, child helmet give-away projects combined with education, and stepping up helmet production. These efforts culminated with the introduction of a mandatory helmet law in December 2007. The law has been an unqualified success with an observed 90% helmet use and reductions in deaths and brain injuries resulting from motorcycle crashes.

However it has not been without its challenges. Two weeks after the law came into effect the media identified a loophole – there was no fine for drivers of child passengers not wearing a helmet. At the same time the country's medical community publicly questioned whether helmets might cause serious neck injuries in children under 14 years in the event of a collision. Parents responded by actively avoiding putting helmets on their children and usage for this age group fell to 10–25%. Quick action was needed to minimize the risk to children from the inaccurate information and legal loophole. A strategy including educating the public on the facts, further research on children and helmets and working with the government of Viet Nam to address the legal loophole was developed and is currently being implemented.



© Asia Injury Prevention Foundation

Drowning

Water touches every aspect of children's lives. They need it to grow, they are comforted by it, they are cleaned and cooled by it – and without it they cannot survive. Water to most children means fun, play and adventure – in a pool, pond, lake or simply in the road following a rain storm. Water, though, can be dangerous. A small child can drown in a few centimetres of water at the bottom of a bucket, in the bath, or in a rice field.

The magnitude of drowning

What is drowning?

Drowning refers to an event in which a child's airway is submerged in liquid, leading to an impairment to breathing. The outcome can be fatal or non-fatal, with some non-fatal drowning events leading to significant neurological damage.

In many South-East Asia and western Pacific countries drowning is the leading cause of child injury deaths.

Drowning results in over 175 000 deaths in children and youth aged 0–19 each year. More than 450 children drown each day throughout the world and thousands suffer serious lifelong disabilities, including brain damage from non-fatal drowning events. Between 2–3 million children under 15 years of age experience a non-fatal drowning event each year.

Children who are victims of non-fatal drowning events often require lifelong financial and health-care support, estimated to be the highest average lifetime costs of any other injury. The results of a drowning event can also have a devastating impact on families emotionally and economically, creating a crisis that can push families into poverty. In South-East Asia, drowning is the number one cause of child injury deaths while globally it ranks third.

Populations most at risk are those living in low-income countries, particularly densely populated ones with high exposure to open water. Drowning takes many people by surprise, as it happens silently, usually within minutes.

RUBY'S STORY

Christmas is a joyous time for most, but for parents Scott and Amanda and older sister Abby, Christmas Eve 2006 was the day they found their 14 month old daughter Ruby face down in their home pool. She was grey, lifeless and without a heartbeat. Ruby was pulled from the water and Scott began cardiopulmonary resuscitation while Amanda frantically called an ambulance which took 40 minutes to arrive. To everyone's relief her heart began to beat and she was rushed to hospital.

Ruby was given a 10% chance of survival and Scott and Amanda were warned that if she did survive, long-term brain damage was highly likely. But after spending Christmas day in an induced coma and a total of three weeks in the paediatric intensive care unit, against all odds, Ruby made a miraculous recovery. Although Ruby's survival is not typical of children who have experienced a non-fatal drowning incident, the circumstances in which it occurred are very common. A lapse in adult supervision even for very short periods of time is a major contributing factor to children drowning.



© S. Cooper

More than 98% of all childhood drowning worldwide occurs in low-income and middle-income countries, with the highest incidence in the Western Pacific Region, which has almost twice the rate of drowning as the global average (Table 7). Records of drowning in most regions worldwide indicate that boys drown at nearly twice the rate of girls, and children aged 1–4 years of age are at greatest risk. However, recent community surveys undertaken in five south and east Asian countries suggest that current global numbers may be an under-estimate of the true magnitude of child drowning deaths, highlighting the critical need to enhance water safety.

Table 7: Fatal drowning rates per 100 000 children^a by sex, country income level and WHO region, World, 2004

| | Africa | | Americas | | South-East Asia | | Europe | | Eastern Mediterranean | | Western Pacific | |
|------------|--------|-----|----------|-----|-----------------|-----|--------|-----|-----------------------|------|-----------------|-----|
| | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC |
| Boys | 9.0 | 1.8 | 5.0 | 7.1 | 0.8 | 5.5 | 10.7 | 9.0 | 1.7 | 17.5 | | |
| Girls | 5.4 | 0.7 | 1.8 | 5.2 | 0.3 | 2.4 | 1.6 | 4.5 | 0.7 | 9.9 | | |
| Both sexes | 7.2 | 1.3 | 3.4 | 6.2 | 0.6 | 4.0 | 6.2 | 6.8 | 1.2 | 13.9 | | |

^a These data refer to those under 20 years of age.

HIC = High-income countries; LMIC = Low-income and middle-income countries.

Source: WHO (2008), Global Burden of Disease: 2004 update.

Why are children at risk of drowning?

Children are at risk of drowning for a variety of reasons. Identifying and understanding the factors that put children in danger of a drowning event will assist greatly in their prevention.

Age and developmental stage

Children under the age of 5 years are at highest risk of drowning, followed by adolescents aged 15–19 years (Figure 7). This pattern is generally consistent throughout the world and is related to growth and development processes. Because infants under one year of age are usually unable to access water by themselves, unintentional drowning at this age is mostly the result of a child being left alone or with an unqualified caregiver – such as a young sibling – in or near water. By contrast, children who are more mobile and inquisitive, but still too young to have developed avoidance skills or an awareness of hazards often wander away from the supervising adult and fall or climb into a nearby body of water. For adolescents, experimentation, risk taking and increased independence all lead to increased drowning risk.

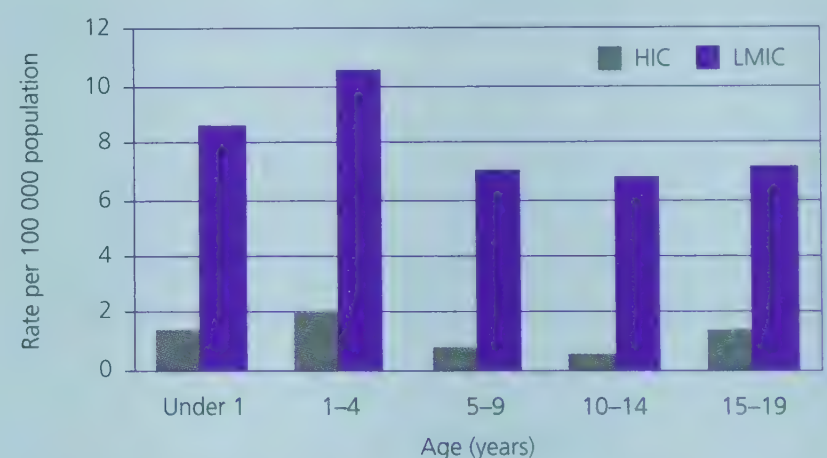
Gender

Boys are at greater risk of drowning than girls because of their greater exposure to water environments and risk-taking behaviours particularly as adolescents.

Poverty

There is a strong association between socioeconomics and child drowning, particularly with respect to the educational background of parents or caregivers, family size and ethnicity. Various studies have shown that particular ethnic groups are at increased risk for drowning. The reasons for this are not clear, but explanations could include differences in swimming ability and experience in water, lack of opportunities to learn to swim, and lack of supervision in environments where population groups at high-risk swim.

Figure 7: Fatal drowning rates per 100 000 children by age and country income level, World, 2004



HIC = High-income countries; LMIC = Low-income and middle-income countries.

Source: WHO (2008), Global Burden of Disease: 2004 update.

Safety equipment

Flotation devices such as life jackets are indispensable on all vessels, whether used for transport or for pleasure. In addition to the lack of flotation devices, the poor maintenance of such equipment is an additional risk. Only approved safety equipment should be used for children and it should not substitute adequate supervision.

Unsafe transport

Children, as well as adults, are at increased risk of drowning while travelling on larger boats and ferries that are overcrowded, unseaworthy or lacking safety equipment.

Alcohol

Alcohol use has been linked with 25–50% of adolescent and adult deaths associated with water recreation. For adolescents the use of alcohol while in or near water can result in a lack of judgement, coordination and balance, increasing their risk of drowning in the event that they encounter a difficult situation. While the direct contribution of alcohol to drowning has received considerable attention, little work has been done to estimate the risk to children of alcohol consumption by those supervising them, but this issue should be considered.

Physical location

Most child drowning events happen in or around the home. In low-income and middle-income countries drowning usually occurs in open bodies of water, or water collection systems during everyday activities such as playing, washing, collecting water or crossing water to reach school. In high-income countries most drowning occurs in homes or recreational locations which have swimming pools. Children living in rural communities are at greater risk of drowning than those in urban settings.

Climate

Climatic conditions also put children at risk of drowning as a result of cataclysmic floods and *tsunamis*. According to UNICEF, one-third of the victims that died during the South-East Asia *tsunami* in 2004 were children.

Vacationing

Children can also be at higher risk of drowning when they are on vacation because of greater exposure to water and not being familiar with the surroundings. In some countries more children drown while abroad on vacation than at home.

Places where children drown:

- Sea, lakes, streams
- Swimming pools
- Wells, cisterns
- Buckets
- Bathtubs, spas
- Garden ponds

“Considering that drowning is the second leading cause of injury death worldwide and the single leading cause of child death (including disease) in some countries, the focus this critical report brings to the problem and viable preventive measures is immensely valuable. Now comes the time for action.”

Alan Whelpton
World President, International Life Saving Federation

What can be done to prevent drowning?

Drowning incidents can be reduced through the use of effective prevention strategies (see Table 8). In addition, a few promising practices should be evaluated in various settings.

Table 8: Summary of proven and promising drowning prevention strategies

| STRATEGY | EFFECTIVE | PROMISING |
|---|-----------|-----------|
| Removing (or covering) water hazards | ✓ | |
| Requiring isolation fencing (4-sided) around swimming pools | ✓ | |
| Wearing personal flotation devices | ✓ | |
| Ensuring immediate resuscitation | ✓ | |
| Ensuring the presence of lifeguards at swimming areas | | ? |
| Conducting targeted awareness-raising on drowning | | ? |

Given the complexity of drowning events, strategies for prevention need to relate to the circumstance and locations involved using multifaceted approaches as much as possible.

Environmental and engineering approaches

- Drain unnecessary accumulations of water in baths, ponds, buckets, etc. Experts agree that reducing the exposure to sources of water that young children can climb or fall into can reduce drowning.
- Build safe bridges and install piped water systems to reduce exposure to open bodies of water. Historically in low-income and middle-income countries drowning reductions have been achieved by implementing these two strategies.
- Cover wells and rainwater collection sites (e.g. cisterns, barrels) with heavy grills. Creating a barrier between children and water collection containers reduces the risk of drowning.

Legislation and standards

Build and maintain four-sided isolation fencing with self-latching gates around swimming pools and enforce legislation. These barriers have been proven to successfully reduce drowning where implemented and enforced.

Education and skill development

- Swimming lessons provide skills for children over 5 years, but controversy exists around teaching children to swim as a drowning prevention strategy. More research is needed to evaluate the effectiveness of swimming lessons in preventing drowning and to specify what sort of swimming and survival skills should be taught.
- While no studies have evaluated the effectiveness of lifeguarding as a primary prevention measure, trained lifeguards at beaches and public swimming pools ensure adherence to performance standards, execute water rescues, assist in controlling risk-taking behaviour and model safe behaviour.
- Educate parents and caregivers about drowning risks and the importance of supervision. In particular teach about the dangers of leaving young children up to age five years alone or with another young child in or around any body of water.
- Teach parents and caregivers basic life-saving and first aid skills. Without immediate first aid (including basic cardiopulmonary resuscitation), subsequent advanced and invasive life support techniques are of little value in most drowning cases.
- Train the general community in cardiopulmonary resuscitation. Immediate resuscitation initiated by bystanders increases survival of children who drown.

What needs more evidence or should be avoided?

- Much controversy surrounds the issue of **teaching children under 5 years to swim**. While it is clear that learning to swim is an important skill, whether it is protective against drowning requires further rigorous evaluation.
- Other interventions such as restricting access to **unsafe areas**, **doctors providing counselling to parents** or **introducing laws on blood alcohol content for swimmers** requires further evaluation.
- **Solar pool covers and baby bath seats** are not drowning prevention devices and also not a substitute for adult supervision.

Covering wells in Mexico

In Mexico there is a saying “close the well after the drowned child”, an apt saying, given that having a well on a property increases the risk of child drowning almost seven times. The risk of children drowning in wells can be greatly reduced if well openings are closed with a locked hatch. However, as water must be drawn out of wells daily, this is an unsatisfactory solution, particularly if the hatch or lid is large enough for a toddler to fall through. The most effective way to prevent children from drowning in wells is the installation of a pump (either manual or electric) that brings water up from the well. This solution makes it easier to obtain household water while eliminating the risk of child drowning.



© M. Peden, WHO

Burns

Children are naturally curious. As soon as they are mobile they want to explore their surroundings and play with new objects. Yet this learning process means they come into contact with objects that can cause severe injuries. Playing with fire or touching hot objects can result in burns, causing intense pain and often long-term consequences. This creates suffering not just for the children but also for their families and the broader community.

The magnitude of burns

What is a burn?

A burn is defined as an injury to the skin or other body tissue caused by heat. It occurs when some or all of the cells in the skin or other tissues are destroyed by hot liquids (scalds), hot solids (contact burns), or flames (flame burns). Injuries to the skin or other body tissue as a result of radiation, radioactivity, electricity, friction or contact with chemicals are also considered burns.

Globally in 2004, nearly 96 000 children and youth under the age of 20 years were fatally injured as a result of a fire-related burn (Table 8). While burns from fire contribute to the majority of burn-related deaths in children (about 95%), scalds and contact burns are an important cause of non-fatal burns and a significant cause of disability.

Burns can result in significant long-term consequences which – in the absence of a comprehensive and coordinated rehabilitation programme – can leave children scarred, physically and psychologically, for the rest of their lives. The most common physical long-term consequences following a burn include severe scarring, limited mobility, or an amputation of a limb.

Types of burns

Thermal burns include:

- scalds – caused by hot liquid or steam
- contact burns – caused by hot solids or items such as hot pressing irons and cooking utensils, as well as lighted cigarettes
- flame burns – caused by flames or incandescent fires, such as those started by lighted cigarettes, candles, lamps or stoves
- chemical burns – caused by exposure to reactive chemical substances such as strong acids or alkalis
- electrical burns – caused by an electrical current passing from an electrical outlet, cord or appliance through the body.

Inhalation burns are the result of breathing in superheated gases, steam, hot liquids or the noxious products of burning substances. Smoke inhalation is the strongest determinant of death from a burn.

Burns place a heavy economic load on health-care services. A study from the United States found that the cost of hospitalization from burns ranged from US\$ 1187 for scalds to US\$ 4102 per injury for those resulting from fires. In addition there are also costs to the families of children associated with hospitalization, the need for long-term rehabilitation, lost school days and education, possible future unemployment, social rejection and other psychosocial issues. There is great

VUSI'S STORY

Five years ago, when he was 13, Vusi suffered serious burns. He woke up one night to find his blanket and bedroom ablaze from a candle that had fallen over. The flames burned his face, hands and feet. After many months in hospital, he left wearing a brown elasticized pressure garment. From the start, Vusi was very sensitive about his appearance. In addition, the long hospital stay and the psychological stress led to problems at school, and his education was delayed. Despite all this, Vusi has become a charming, friendly person with an engaging smile. He loves music and voluntarily spends time with blind children and others with disabilities, encouraging them to exercise more.



© Children of Fire

He was supported by Africa's first burns charity, *Children of Fire*, which helps severely burned children to obtain complex surgery, therapy and education. The organization also conducts community education and is involved in promoting safer stoves and candle holders. In June 2007, Vusi and 14 other teenaged burns survivors climbed Mount Kilimanjaro to raise awareness of burn injuries and how to prevent them, and to increase tolerance of disability and disfigurement.

potential to reduce these individual and societal costs through effective burn prevention interventions. A recent study in Ontario, Canada, for instance, found that a combination of educational and legislative measures could save 531 Canadian dollars (US\$ 507)per scald.

Burns can result in significant long-term consequences – physical, psychological and financial.

Table 9: Mortality rates due to fire-related burns per 100 000 children^a by sex, WHO region and country income level, 2004

| | Africa | | Eastern Mediterranean | | Europe | | South-East Asia | | Americas | |
|------------|--------|-----|-----------------------|------|--------|------|-----------------|------|----------|------|
| | LMIC | HIC | LMIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC |
| Boys | 8.9 | 0.7 | 0.7 | 3.3 | 0.2 | 1.3 | 0.6 | 3.6 | 0.3 | 0.4 |
| Girls | 8.5 | 0.6 | 0.6 | 9.1 | 0.2 | 1.0 | 0.1 | 5.8 | 0.3 | 0.8 |
| Both sexes | 8.7 | 0.7 | 0.6 | 6.1 | 0.2 | 1.1 | 0.4 | 4.7 | 0.3 | 0.6 |

^a These data refer to those under 20 years of age.
HIC = High-income countries; LMIC = Low-income and middle-income countries.
Source: WHO (2008), Global Burden of Disease: 2004 update.

The burn death rate for children in low-income and middle-income countries is eleven times higher than that in high-income countries. Most deaths occur in poorer regions of the world, including Africa and South-East Asia, and the low-income and middle-income countries of the Eastern Mediterranean. Infants have the highest death rates, while those aged 10–14 years have the lowest. The death rate climbs again for 15–19 year olds, possibly as a result of greater exposure, experimentation and risk taking, as well as the fact that many youth in this age group are beginning employment.

Burns are the only type of unintentional injury where females have a higher rate of injury than males (Figure 8). The greatest gender discrepancies are found in South-East Asia and in the low-income and middle-income countries of the Eastern Mediterranean where the rates for girls aged 15–19 years are substantially higher than rates for the same age group in any other region.

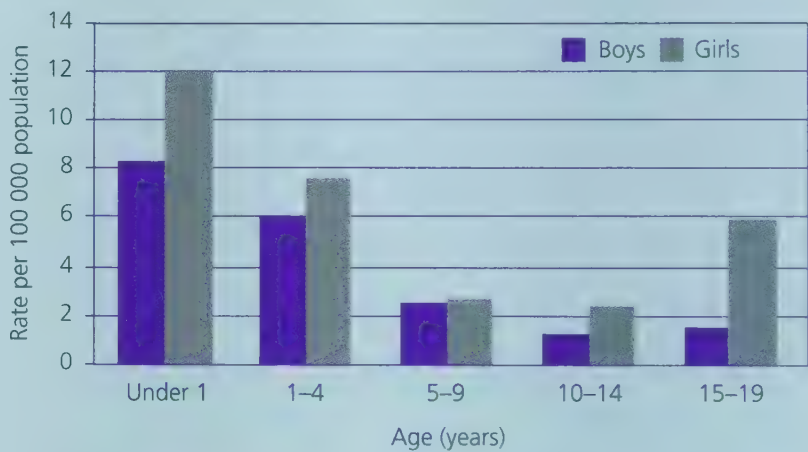
Why are children at risk of burns?

Children are at risk of burns for a variety of reasons. Identifying and understanding the factors that put children in danger of a burn will assist greatly in their prevention.

Age and developmental stage

For young children the level of motor development does not always match the child’s cognitive and intellectual development, and burns can occur more easily. Infants under the age of one year are at particular risk as they start to become mobile and they reach out to touch objects. The burns they suffer are most commonly the result of scalds from cups containing hot drinks or contact burns from radiators or hot-water pipes. Scald burns are the most frequent type of burn among children under the age of six. These often happen when a child pulls down a container of hot fluid, such as a cup of coffee, onto his or her face, upper extremities and trunk. Boys older than 6 or 8 years often become curious about fire, leading to experimentation with matches, lighters or fireworks.

Figure 8: Fatal fire-related burn rates per 100 000 children by age group and sex, World, 2004



Source: WHO (2008), Global Burden of Disease: 2004 update.

Gender

Burns are the only type of fatal injury that occurs more frequently among girls than boys in South East Asia and low-income and middle-income countries in the Eastern Mediterranean and Western Pacific Regions. Local customs of using open fires for cooking and heating, together with the wearing of loose-fitting clothing, particularly among teenage girls in the South-East Asia and Eastern Mediterranean regions, are associated with an increased rate of burns among young women. For non-fatal burns, the pattern is not quite as clear, and in some settings boys may be at a greater risk of burns than girls, due to their inquisitive nature and greater risk-taking behaviours.

Socioeconomics and poverty

Death and disability from burns are strongly associated with poverty. In addition to the markedly higher incidence of burns among children in low-income and middle-income countries, there are also differences by socioeconomic class *within* high-income countries, with studies showing an increased risk of burns among poorer children. A systematic review found that those in the lowest category of income were 2.4 times more likely to die in a house fire than those in the highest two income categories. Other socioeconomic factors include: low rate of literacy within the family; living in overcrowded dwellings or with cluttered areas in the home; failure to properly supervise children; history of burns among siblings; and the absence of laws and regulations relating to building codes, smoke detectors and flammable clothing. Inadequate access to a good supply of water in the form of a tap, hosepipe or sprinkler system to douse flames or stop flames spreading is another strong risk factor.

Unsafe equipment

In low-income and middle-income countries, heat sources, light sources and cooking equipment, especially those relying on fossil fuels, all carry inherent risks. In particular, heating or cooking using open fires that stand at ground level pose significant dangers to children. There are similar dangers in the use of small kerosene stoves or lanterns, candles for lighting, and other volatile or highly flammable fuels within the home. Easy access for children to cooking appliances or pots with boiling liquids is a further risk factor for burns.

Flammable substances

Flammable substances such as kerosene and paraffin should not be stored in the home. Community programmes to ensure good supervision of children, particularly those with developmental disabilities, to educate parents about burns and to advise against the storage of flammable substances in the home, have all been proposed as primary prevention strategies for burns. In addition to creating a danger of fire, they also pose a poisoning risk for small children as they are frequently kept in containers without child-resistant lids.

Fireworks

Fireworks pose a significant risk for children, particularly adolescent boys. Many countries celebrate religious or national festivals by setting off fireworks and many burn injuries regularly occur around these holidays. Fireworks have been banned in many high-income countries, but in most low-income and middle-income countries there are no laws restricting the use of fireworks.

Cooking and living areas

The overwhelming majority of childhood burns occur in the home, and in particular in the kitchen. It has been suggested that the location within the home of heating equipment and the structure of the kitchen may present significant risks to children. Homes that consist of one or two main rooms divided by temporary internal divisions made of curtains or cardboard and utilized for functions such as sleeping, washing, cooking and eating may greatly increase the exposure of a child to domestic equipment and sources of heat. Similarly, a lack of smoke detectors or the presence of non-functioning smoke detectors appears to be related, in some developed countries, to an increased risk for childhood burns.

Time of incident

Two peak times of the day have been reported for incidents involving burns – the late morning, when domestic tasks are being done, and around the time for the evening meal. In some regions of the world there have also been peaks noted by season and burns related to public or religious holidays.

“My worst experience took place on a crowded bus. Other passengers kept looking at me so I took my jacket off and covered my head. I just wanted to be invisible and I wanted them all to disappear too.”

Michael

Aged 17, from Changing Faces, a United Kingdom nongovernmental organization for people with disfigurements

What can be done to prevent burns?

Burns can be reduced through the use of effective prevention strategies (see Table 10). In addition, a number of promising practices should be tested in various settings.

Table 10: Summary of proven and promising burn prevention strategies

| Strategy | Effective | Promising |
|--|-----------|-----------|
| Setting (and enforcing) laws on smoke alarms | ✓ | |
| Developing a standard for child-resistant lighters | ✓ | |
| Setting (and enforcing) laws on hot tap water temperature and educating the public | ✓ | |
| Treating patients at dedicated burns centres | ✓ | |
| Separating cooking areas from living areas | | ? |
| Developing standards and codes for fire-retardant garments | | ? |
| Banning the manufacture and sale of fireworks | | ? |
| Promoting the use of safe lamps and stoves | | ? |
| Providing first aid for scalds (i.e. 'cool the burn') | | ? |

Environmental and engineering approaches

- Develop and make available safe lamps and stoves and move stoves outdoors and off the ground to reduce child access and exposure to indoor fumes. The trial of an improved wooden stove in rural Guatemala decreased both acute lower respiratory infections and fire-related burns.
- Separating cooking areas from living areas has shown to be a promising strategy but still requires rigorous evaluation.

Legislation and standards

- Establish and enforce legislation requiring the installation of smoke alarms. Ensure that all homes have working smoke alarms on all levels, including in the sleeping areas. For optimum protection, test smoke detectors monthly and change the battery twice a year, or use new devices that have long-lasting batteries or are hardwired into the housing construction. Smoke detectors have been found to reduce the risk of death in a house fire by over 70%.
- Develop and enforce standards for the design and provision of child-resistant lighters. A study in the USA found that introducing a standard reduced fires, deaths and injuries caused by young children playing with lighters by as much as 58%, saving more than US\$ 1.5 billion in societal costs in 1998 alone.
- Develop and enforce legislation requiring the regulation of the temperature of hot water from household taps. A Canadian study evaluated the effectiveness of a combined educational and legislative approach to reduce thermostat settings, and found a 56% reduction in scald burns.
- Develop and enforce standards and codes for fire-resistant garments. Modifying products associated with fire-related burns is a promising approach. Following the introduction in Australia of fire-retardant material for children's bedclothes in 1979, the annual number of burns related to clothing dropped from approximately 300 to 30.
- Establish and enforce legislation banning the manufacture and sale of fireworks. Many high-income countries have banned firework purchase or ownership by children. A recent review in the United Kingdom showed that while the introduction of the Fireworks Act in 2003 and related Regulations in 2004 (which limited the sale of fireworks and banned the sale or possession of fireworks by under 18 year olds) had a definite impact on reducing firework injuries, stricter enforcement was required.

Education and skill development

- Educate and train parents, caregivers and the community in immediate first aid for scalds/burns. The overall aim must be to cool the burn with water, prevent ongoing burning and prevent contamination.

Managing burns

- Cool the burn surface. This is one of the oldest methods of first aid treatment. In Viet Nam, a study comparing children who had received immediate cooling with water after a burn with those who had not found that those who received proper first aid needed 32% less subsequent skin grafting.
- Establish, operate and maintain dedicated burn centres. Although not all children require management in a burns centre, expert opinion supports the claim that children with serious burns will have better outcomes with less costly management if they are in a dedicated burn centre.
- Provide rehabilitation facilities. Children who sustain burns deserve the best rehabilitation facilities available, so that they are able to return to productive and fulfilling roles within their community. Inadequate rehabilitation can result in physical and psychological damage with a serious, lifelong effect.

What needs more evidence or should be avoided?

- There is insufficient evidence to promote the use of **community-based campaigns** and interventions including the distribution of smoke alarms (without accompanying laws), installing residential sprinklers and other home modifications, or home visitation programmes for at-risk families.
- **Butter, sugar, oil and other traditional remedies** should not be used on burns.

'Hot water burns like fire' campaign, New South Wales

In 1992, the Australian state of New South Wales launched the country's first state-wide prevention campaign for scalds in children called 'Hot water burns like fire'. The campaign followed the publication of a report on injuries in emergency departments that showed scalds as the fourth biggest cause of hospitalization among young children. As a result of this campaign, the whole of Australia now has laws mandating a maximum temperature of 50°C for hot water taps in bathrooms, and for new installations fitted and old ones that are replaced.

The first phase of the campaign raised awareness to about the causes of scalds to children, the most serious and preventable one being hot tap water. The second phase focused on how to modify temperatures of hot water taps in bathrooms with related professionals amending standards and then implementing them. Between 1989 and 1996, the rate of hospitalization for scalds involving young children aged 0–4 years fell by 13% and the length of hospital stay dropped by 18% – providing a net 27% reduction in the total number of hospital beds utilized. Rates for the most serious scalds showed the greatest decline – a reduction of 30% for the two years following the second phase of the campaign. In all, there was an annual saving to the health-care system of between 3.8 and 6.5 million Australian dollars.



© K. McGee

"Thermal burns are a common cause of accidental death in children worldwide. Despite various methods of prevention and care, such injuries are on the rise. Only through a deeper understanding of the underlying causes can we develop truly viable alternative solutions. If the proposals outlined in this report are implemented correctly, they can bring about the necessary changes."

Mehmet Haberal
President of the International Society for Burn Injuries

Falls

Falling is a normal aspect of child development and part of the process of learning to walk, run, jump, climb, explore and negotiate the physical environment. Fortunately, most children fall without sustaining more than a few cuts or bruises. However, some falls exceed the resilience of the human body and the capacity of the contact surface to absorb the energy transfer involved. This makes falls an important cause of childhood injuries, including those resulting in permanent disability and death.

The magnitude of falls

Globally nearly 47 000 children under 20 years of age die as a result of a severe fall each year – that is more than 128 children fall to their death each day. Falls are the twelfth leading cause of death for children aged 5–9 and 15–19 years. Children under the age of 1 year have the highest fall rates (Figure 9).

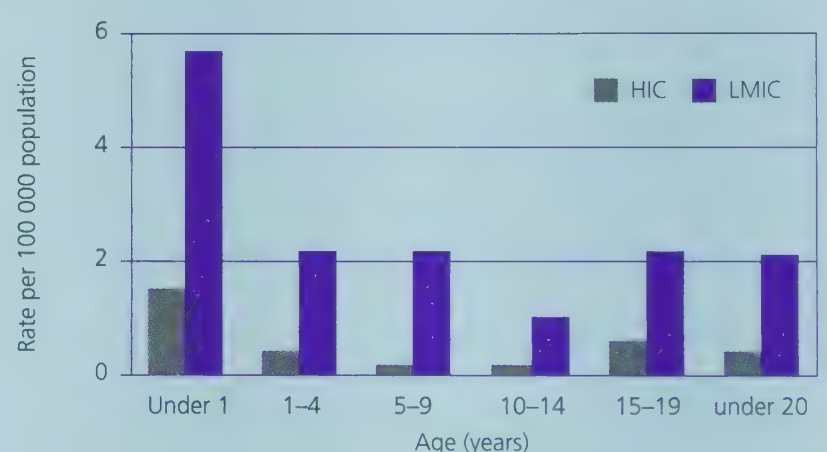
Falls have the greatest injury and disease burden for children aged 5–14 years and in most countries falls are the most common type of childhood injury presenting at emergency departments, accounting for between 25–52% of visits. In China for example a survey revealed that for every death due to a fall, there were 4 cases of permanent disability, 13 cases requiring hospitalization for 10 or more days, 24 cases requiring hospitalization for 1–9 days, and 690 cases that sought care or missed at least one day of work or school, demonstrating the impact that fall injuries have in addition to deaths.

Generally, the greater the height from which a child falls, the more severe the injury, and as children grow older, an increasing number of falls are from greater

What is a fall?

A fall is an event that results in a person coming to rest inadvertently on the ground or floor or other lower level.

Figure 9: Fatal fall-related injury rates per 100 000 children by age and country income level, World, 2004



HIC = High-income countries; LMIC = Low-income and middle-income countries.
Source: WHO (2008), Global Burden of Disease: 2004 update.

SOHEL'S STORY

Sohel, 14, was the main breadwinner in his four-member family. He lived in Krishnapur village, Narsingdi district, Bangladesh. He lost his father when he was 7 years old. Because of their economic hardship, Sohel had to drop out of school when he was in the seventh grade. To earn a livelihood, he started cultivating their small piece of land. He used to grow rice and other agricultural produce, which were mostly needed for family consumption. Sohel and his friends used to go fishing to earn extra cash for their daily livings.

It was the rainy season in 2004. Sohel went fishing with his two friends, stopping at an old mosque where renovation work was being done. Sohel, an inquisitive boy, climbed up to the roof of the mosque, ignoring his friends' pleas to come down. He went to the edge of the roof but stumbled on some construction materials lost his footing and fell. He was badly hurt, and was taken to the nearest health centre 15 kilometres away, where he died. Children like Sohel should not die from these preventable injuries. Action needs to be taken now.



© C. Khasnabis

heights. Falls are the leading cause of traumatic brain injury, especially in young children, with a significant risk of long-term neurological damage. Falls are also costly. An estimate from Canada suggests that if proven fall prevention strategies were implemented it would result in a 20% reduction in the incidence, and a net saving of over 126 million Canadian dollars (US\$ 120 million) annually.

Low-income and middle-income countries in South-East Asia and the Eastern Mediterranean Regions have the highest child death rates from falls globally, with more than a 10 times the rate of high-income countries in the Americas (Table 11). Children under 1 year in low-income and middle-income countries are at greatest risk. In every region in the world more boys die from falls than girls. In most high-income countries, children under 1 year are most likely to fall from furniture or car seats, or as a result of being dropped; children aged 1–3 years are most likely to fall from stairs and steps, windows, furniture or play equipment; and older children typically fall from playground equipment, from being pushed or shoved, or while on fire escapes, roofs and balconies.

Table 11: Fatal fall-related injury rates per 100 000 children^a by sex, WHO region and country income level, 2004

| | Africa | | Americas | | South-East Asia | | Europe | | Eastern Mediterranean | | Western Pacific | |
|------------|--------|-----|----------|-----|-----------------|-----|--------|-----|-----------------------|-----|-----------------|-----|
| | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC |
| Boys | 1.8 | 0.3 | 1.0 | 3.0 | 0.5 | 1.3 | 4.0 | 3.5 | 0.5 | 2.5 | | |
| Girls | 1.1 | 0.1 | 0.4 | 2.4 | 0.2 | 0.6 | 0.3 | 2.3 | 0.3 | 1.9 | | |
| Both sexes | 1.5 | 0.2 | 0.7 | 2.7 | 0.3 | 1.0 | 2.2 | 2.9 | 0.4 | 2.2 | | |

^a These data refer to those under 20 years of age.

HIC = High-income countries; LMIC = Low-income and middle-income countries.

Source: WHO (2008), Global Burden of Disease: 2004 update.

Why are children at risk of falling?

Children are at risk of falling for a variety of reasons. Identifying and understanding the factors that put children in danger of a fall will assist greatly in their prevention.

Age and developmental stage

Young children are at risk as their curiosity and need to become familiar with their surroundings generally does not match their capacity to assess or react to danger. As children get older, their ability to react to danger more often coincides with increasing levels of independence, greater play and travel further from home, increased physical activity, and more challenging and daring behaviours commonly referred to as 'risk taking', thereby exposing them to more situations where a fall may occur.

Gender

Boys are at greater risk of fatal and non-fatal falls. This is partially explained by child-rearing patterns, socialisation, role expectations and boys' greater participation in risk-taking behaviours and rough play.

Poverty

There is a strong relationship between social class and childhood falls both between regions as well as within countries. Risks identified include greater exposure to overcrowding, hazardous environments, sole parenthood, unemployment, younger maternal age, low maternal education, caregiver stress and mental health problems, and inequities in access to health care.

Children with disability

The presence of intellectual disability can lead to an eight-fold excess in risk of unintentional injury including falls. Children in wheelchairs are also particularly at risk, regardless of their cognitive ability, with falls estimated to account for 42% of injury incidents among wheelchair users.

Physical environment

The built environment, including house design and structure, urban planning, recreation areas and land use is an essential element for child health and development, but can also be a source of fall-related injuries. The contributing factors may include inadequate or deferred property maintenance, particularly in low-income rental properties, and building and product designs that do not take into account the developmental abilities of young children or the needs of their families, such as poor lighting, lack of window guards in high-rise buildings, missing railings for stairs, balconies and open roof access.

Sociocultural environment

Inadequate adult supervision is often cited as a major factor in childhood injuries but the issues involved are complex and interact with many factors challenging the most vulnerable and at-risk families. Parents, social service workers and medical personnel generally agree that pre-schoolers in particular should be supervised ‘constantly’, which means fewer than five minutes at a time without supervision to minimise the risk of injury. In poorer families, children may not only be unsupervised, but be expected to care for their younger siblings.

Access to treatment and rehabilitation

In low-income and middle-income countries surveys suggest that significant proportions of children, including those with moderate to severe fall-related injuries, do not get medical care because of long distances from hospitals, prohibitive transportation costs, a lack of access due to cost and resources required, and a lack of caregiver awareness of the need for early attention.

Where do children fall from?

- Prams, baby walkers, high chairs, changing tables
- Cots, beds, bunk beds
- Rooftops, windows, balconies
- Stairs, balustrades and banisters
- Trees
- Playground equipment such as swings, roundabouts, slides, trampolines
- While playing organized sport
- Roller-blading, skiing, skating
- Horse riding, camel racing

Falls are the most common type of childhood injury presenting at emergency departments, accounting for between 25–52% of all such visits.

What can be done to prevent falls?

Falling incidents can be reduced through the use of effective prevention strategies (see Table 12). A number of promising interventions should also be tested in various settings.

Table 12: Summary of proven and promising fall prevention strategies

| STRATEGY | EFFECTIVE | PROMISING |
|--|-----------|-----------|
| Implementing multifaceted community programmes such as ‘Children Can’t Fly’ | ✓ | |
| Redesigning nursery furniture and other products | ✓ | |
| Establishing playground standards for the depth of appropriate surface material, height of equipment and maintenance | ✓ | |
| Legislating for window guards | ✓ | |
| Using stair gates and guard rails | | ? |
| Conducting supportive home visitation and education for at-risk families | | ? |
| Holding mass media campaigns directed at parents, health workers | | ? |
| Providing appropriate paediatric acute care | | ? |

The high burden of morbidity, health-care costs, and the significant risk of death because of head injuries demand that preventing fall-related injuries is made the focus of child safety efforts worldwide.

Environmental and engineering approaches

- Identify, replace or modify unsafe products. Many high-income countries achieved major reductions in childhood fall injuries by removing or redesigning nursery furniture such as cribs, changing mats, baby walkers, and bunk beds, playground equipment, sports and recreational equipment.
- Provide and install stair gates. Support to families such as offering free home safety equipment such as stair gates, fitted free of charge, can improve safety practices of families living in deprived areas.

Legislation and standards

- Establish and enforce legislation requiring the installation of window guards by landlords. A large decrease in fatal falls of young children from high-rise buildings was observed in one state in the United States following the passage of window guard installation legislation
- Develop and enforce standards for the design and maintenance of safe playgrounds with installation of rubber or bark ground surfacing of sufficient depth, and incorporate safer heights of structures and equipment such as slides. These approaches have substantially reduced playground injuries in many high-income countries.

Education and skill development

- Develop and provide mass media and leaflet campaigns for low-income and middle-income countries with home safety and injury prevention education directed at parents, health professionals, law enforcement officers, municipal officials, construction workers and policy-makers.

Combined strategies

- Establish and provide home visits in the early childhood period. These visits have been used to meet a wide range of objectives, including improvement of the home environment, family support and the prevention of behavioural problems in children. Evidence demonstrates that home visits including programmes directed at more disadvantaged families are effective in improving home safety and in reducing injury risks. The visits appear to be most effective when the information provided is targeted, age appropriate, and combined with the provision and installation of safety equipment.
- Use multiple strategies repeated in different forms and contexts as a means of fostering a culture of safety within communities. Fall prevention is commonly included among the goals of community-based programmes designed to reduce childhood injury and have been particularly effective in the installation of window guards in high-rise buildings.

What needs more evidence or should be avoided?

- There is insufficient evidence to promote the use of **educational campaigns only** to prevent falls or to implement building and housing codes.
- **Covering wells and ditches**, although proven to prevent drowning, has not yet been evaluated in fall prevention.

'Children can't fly' campaign, New York

'Children Can't Fly' was a programme developed by the New York City's Department of Health in the early 1970s, to counter the high rates of death and injury among children following falls from windows. The programme involved a law requiring that window guards be installed in high-rise apartments in which young children lived. In addition to the law there was a *voluntary reporting system* which required that all childhood falls be reported so that a nurse could visit and assess the situation, *counsel* the parents with regard to preventing falls and provide *window guards free of charge* to families with young children living in areas of high-risk.

As a result of the programme, a significant reduction in the incidence of falls was recorded, particularly in the city's Bronx district, where the number of reported falls declined by 50%. Many other cities around the world have since followed New York City's lead. In addition to the lives saved, this intervention has been shown to be cost-effective in terms of savings in hospitalizations, rehabilitation and the costs of caring for injured or permanently disabled children.



© T. Toroyan, WHO

Poisoning

The home and its surroundings can be dangerous for children, particularly for the possibility of unintentional poisoning. Children are naturally curious, exploring in and around the home. As a result, each year millions of calls are made to poison control centres (also called poison information centres), and thousands of children are admitted to emergency departments because they have inadvertently consumed some type of household product, medicine or pesticide. Most of these 'accidental' poisonings could have been prevented.

The magnitude of poisoning

Accidental poisoning results in over 45 000 deaths in children and youth aged 0–19 each year, accounting for 13% of all accidental poisonings globally. As a cause of unintentional injury death among children aged 1–14 years, poisoning ranked fourth after road traffic injuries, fires and drowning in a survey of 16 high-income and middle-income countries in 2000/2001.

While global data on non-fatal poisonings are not available, estimates of the burden these injuries place on society are substantial, and studies from both low-income and high-income countries suggest that poisonings and their management are very costly.

Most common agents involved in childhood poisoning

- Over-the-counter preparations such as paracetamol, cough/cold remedies, vitamins and iron tablets, antihistamines and anti-inflammatory drugs.
- Prescription medications such as antidepressants, narcotics, analgesics and illicit drugs.
- Paraffin/kerosene
- Household products such as bleach, disinfectants, detergents, cleaning agents, cosmetics, vinegar.
- Pesticides including insecticides, rodenticides and herbicides.
- Various poisonous plants.
- Animal or insect bites.

What is a poisoning?

Poisoning refers to cellular injury or death caused by inhalation, ingestion, injection or absorption of a toxic substance or 'poison'. Key factors that predict the severity and outcome of poisoning are the nature, dose, formulation and route of exposure of the poison; co-exposure to other poisons; state of nutrition of the child or fasting status; age and pre-existing health conditions.

"All things are poison and nothing is without poison, only the dose permits something not to be poisonous."

Paracelsus, Encyclopaedia Britannica

HARRISON'S STORY

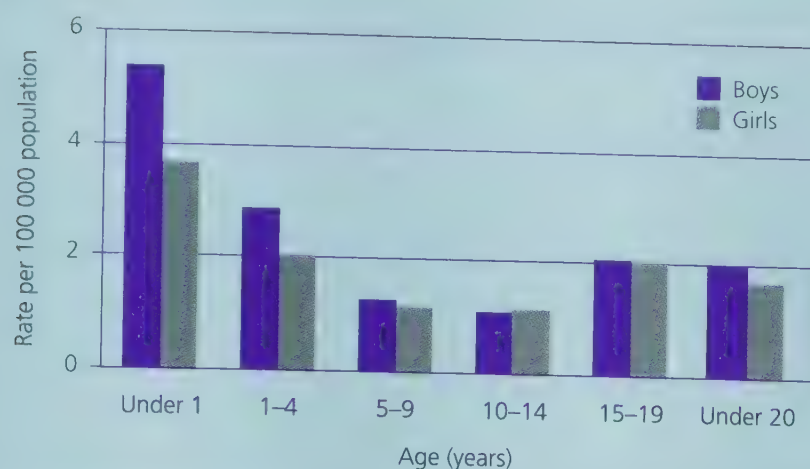
Harrison is the youngest of five children. On the first day of summer holidays, Lisa, Harrison's mum, changed her usual morning routine and instead of checking that the cupboards were all locked in the kitchen, she went to the lounge to put a video on for her older child. During this time, 18-month-old Harrison opened a cupboard, removed the cap from the dishwasher detergent container and drank some of the contents. Although the container had a child-resistant cap, the cap needed to be twisted *twice* in order to be correctly secured. As there were no instructions on the packaging, Harrison's mother was not aware of this.

Harrison survived, but his injuries have changed his life and the lives of his family. His story, and those of other toddlers who had sustained similar injuries were quickly picked up by the media. Within weeks the company had placed warning labels on all their containers alerting consumers to the 'two-click mechanism'. Some months later the container was redesigned to incorporate a flow limiter and 'single-click' closure. Australia now has a legislation which requires that all dishwasher powders must be distributed in child resistant containers with specific warning labels if the pH of the contents exceeds 11.5. Those detergents with a pH of greater than 12.5 have been removed from the domestic market.



© Royal Children's Hospital Foundation

Figure 10: Fatal poisoning rates per 100 000 children by age and sex, World, 2004



HIC = High-income countries; LMIC = Low-income and middle-income countries
Source: WHO (2008), Global Burden of Disease: 2004 update.

Children under the age of one are at greatest risk of fatal poisoning, particularly in low-income and middle-income countries (Figure 10). After infancy, fatal poisonings decrease with age until 14 years when there is once again a slight increase – attributable to either substance misuse or increased exposures because of entry into the workforce. For non-fatal poisoning, incidence is generally higher among children and youth over the age of 1 year.

Low-income and middle-income countries have rates higher than high-income countries in all regions except in the Americas where death rates are higher in the high-income countries (Table 13), particularly for 15–19 year olds. The highest incidence is in Africa and in low-income and middle-income countries of Europe and the Western Pacific Region. In most regions boys have higher rates than girls. Although global data are not readily available on non-fatal poisonings, for every death many thousands of calls are made to poison control centres around the world.

Table 13: Mortality rates due to poisoning per 100 000 children^a by sex, country income level and WHO region, 2004

| | Africa | | Americas | | Europe, East Asia | | Europe | | Eastern Mediterranean | | Western Pacific | |
|------------|--------|-----|----------|-----|-------------------|-----|--------|-----|-----------------------|-----|-----------------|-----|
| | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC | LMIC | HIC |
| Boys | 4.9 | 1.2 | 0.4 | 1.7 | 0.3 | 2.4 | 1.3 | 1.7 | 0.1 | 1.5 | | |
| Girls | 3.0 | 0.4 | 0.3 | 1.6 | 0.2 | 1.7 | 0.0 | 1.5 | 0.1 | 2.1 | | |
| Both sexes | 4.0 | 0.8 | 0.3 | 1.7 | 0.2 | 2.0 | 0.7 | 1.6 | 0.3 | 1.8 | | |

^a These data refer to those under the age of 20 years. HIC = High-income countries; LMIC = Low-income and middle-income countries.
Source: WHO (2008), Global Burden of Disease: 2004 update.

Why are children at risk of poisoning?

Children are at risk of poisoning for a variety of reasons. Identifying and understanding the risks assists in their prevention.

Age and developmental stage

Age and development are strongly associated with poisoning. They influence both the exposure to different types of poisons as well as the outcome from accidental poisoning. Young children are particularly susceptible to the ingestion of poisons, especially liquid ones, as they put most items in their mouths, are very inquisitive and are unaware of consequences. Adolescents, on the other hand, are more aware of the consequences of their actions but peer pressure and risk-taking behaviour can lead them to inadvertently misuse alcohol or illicit drugs, leading to a fatality rate higher than in younger children.

Gender

Boys are at higher risk of poisoning than girls with few exceptions. Where exceptions exist, the discrepancy can be explained by differences in gender socialisation between different countries and different cultures.

Poverty

Lower socioeconomic status is highly associated with both fatal and non-fatal poisonings, not only between countries but also within countries. Poorer families may have increased exposure to some poisons because they use paraffin/kerosene for heating and cooking, have limited storage space to keep poisons out of children's reach, are more likely to live near toxic environments, and may be forced to eat unsafe food. Poorer families are also less likely to have access to poison control centres or good quality acute management.

Characteristics of the poison

The more concentrated or more potent the poison, the greater the risk of severe poisoning or death. Liquid poisons such as liquid paracetamol pose a greater risk than solid ones like dishwasher detergents or tablets as they are easier to swallow. When toxicity is associated with contact to the skin or mouth, as is the case with acidic or alkali substances, greater damage results. Physical features such as size, colour and physical nature may attract or deter a child from handling and ingesting a substance. Studies show that clear liquids are most attractive, as are brightly coloured tablets.

Storage and access of agents

Access to the poison by the child is the greatest predictor of poisoning. Distribution of poisons in containers without child resistant closures increases the likelihood of poisoning. Even when properly contained and labelled, young children are at risk if containers are not stored appropriately by adults. Further, many parents do not understand that child resistant does not mean child proof and that young children may still be able to open the package. Child resistant closures should thus never take the place of good supervision.

Season and weather conditions

Childhood poisoning occurs throughout the year although there is significant seasonal variation for different poisons. Venomous animal bites and ingestion of kerosene, medications and pesticides are highest in summer. Possible explanations include more time outdoors, changes in supervision and increased drinking of fluids during summer months. Carbon monoxide poisoning from heating sources and medication poisoning with cough and cold remedies are more common in the winter.

Sociocultural environment

Evidence from low-income and middle-income countries indicates the importance of sociodemographic risk factors in child poisoning. Factors include young parents, limited adult supervision and those who move house often. In addition, poor living conditions, local beliefs, customs and ignorance of the dangers of chemicals are all risk factors associated with acute poisoning.

Policies, standards and legislation

Many countries do not have policies, standards or legislation to govern the manufacture, labelling, distribution, storage and disposal of toxic substances and by-products of manufacturing. As a result, children are placed at risk of poisoning by exposure to poisons both inside and outside the home. The unregulated packaging and distribution of medicines and other poisonous substances in non-child resistant containers increases ease of child access to toxic substances and lethal doses. The uncontrolled use, storage and dumping of pesticides near homes and in water supplies expose children, especially those from lower socioeconomic levels, to toxins. This is especially true in developing countries where economic forces predispose the use of outdated and higher risk pharmaceutical and non-pharmaceutical substances.

Access to appropriate health-care facilities

In the event of a poisoning, quick and appropriate treatment is essential for a positive outcome. Availability of and access to poison control centres and good quality health facilities affects the severity of poisoning injuries. Thus children living in rural or remote locations where health facilities are non-existent, inaccessible or of poor quality are at greater risk of a poor outcome.

What can be done to prevent poisoning?

As poisoning is often misdiagnosed or goes unrecognized, treatment can be delayed, often with tragic results. Prevention is therefore best and can be achieved through the use of proven prevention strategies (see Table 14). Locking away medicines and other toxic substances, although intuitively a good practice, has not undergone rigorous evaluation.

Table 14: Summary of proven and promising poisoning prevention strategies

| Strategy | Proven | Promising |
|--|--------|-----------|
| Removing the toxic agent | ✓ | |
| Legislating for (and enforcing) child-resistant packaging of medicines and poisons | ✓ | |
| Packaging drugs in non-lethal quantities | ✓ | |
| Establishing poison control centres | ✓ | |
| Locking away medicines and other toxic substances | | ? |

Environmental and engineering approaches

- Remove the poison from the environment, such as the removal of poisonous plants and moving away from individual fuel sources like bottled kerosene to public utilities supplying electricity or natural gas.
- Replace the poison with one of lower toxicity, for example, replacing highly toxic barbiturates (sedative-hypnotics used for sleeping) with a different, safer class of sedative hypnotics (benzodiazepines); reformulation of methylated spirits to include ethyl alcohol rather than methanol.
- Reduce toxicity of the poison by packaging it in non-lethal concentrations or dosages. For example, restricting the sale of acetic acid to a diluted form in Saint Lucia reduced poisonings with this substance.

Legislation and standards

- Develop and enforce standards for child-resistant packaging of necessary poisons such as medicines, household chemicals and other poisonous products. Significant reductions have been achieved in high-income countries using this approach.

Education and skill development

- Ensure safer packaging and storage of medicines and other poisonous products in the home. Experts agree that this involves education of caregivers regarding the risks and the need for safe storage, standards to discourage the use of unsuitable containers for harmful substances, and participation by manufacturers and those dispensing the products. One successful intervention in Africa that involved free distribution of containers with child-resistant closures reduced kerosene poisonings by almost half.

Health care

- Establish poison control centres to prioritise poisonings, dispense accurate and timely advice to caregivers and health facilities, direct first aid where appropriate, and refer more severe poisonings for treatment to health facilities.

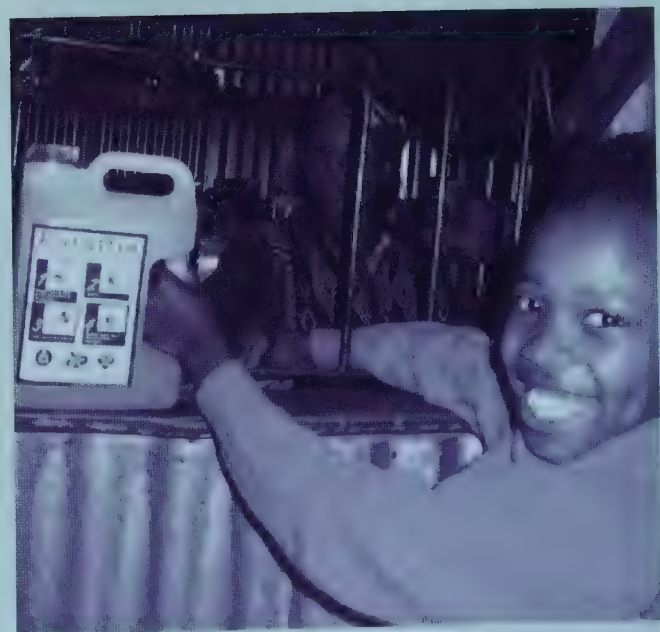
What needs more evidence or should be avoided?

- There is insufficient evidence to support the **regulation or removal of toxic substances** that are easily mistaken for edible items, or **reducing the attractiveness** of toxic products.
- The introduction of **non-standardized, non-reclosable or blister packaging for tablets** has the potential to be harmful as these may not be child-resistant.

Change the package, save a life

Every child has a right to grow up in an environment that is not harmful to its health or well-being. Yet in South Africa, between 40 000–60 000 children are poisoned each year after ingesting paraffin/kerosene – the common heating and cooking fuel used by most families – from unsafe and unlabelled containers. And while not all these poisonings are fatal, the pain and suffering of the children and their families and the cost of treatment to the State are substantial.

This is despite the fact that an effective solution exists. Child-resistant closures – defined as packaging that is difficult for children under the age of five to open, but that an adult can easily open – are the only proven intervention that will reduce paraffin ingestion among children. This proven strategy has already been shown to be transferable in one community in South Africa and it is estimated that the mandatory use of child-resistant closures could save more than 80 lives across the country every year, and reduce the ingestion of paraffin by half.



© L. Matzopoulos, Khuselo Abantwana

The way forward

This report, the first world report on the topic of child injuries, presents the current knowledge about the five most important causes of unintentional injury to children under 18 years, as well as some of the actions that need to be taken in order to tackle the problem.

Main messages from the report

Child injuries are a major public health issue directly linked to child survival. Globally about 830 000 children under the age of 18 years die each year as a result of an unintentional injury, and tens of millions of others sustain non-fatal injuries. This is despite the fact that the majority of countries around the world have ratified the UN Convention on the Rights of the Child, which requires that all appropriate measures be taken to protect children from these injuries.

The good news is that we know what many of those measures are – child injuries can be prevented and much of this executive summary has gone to highlighting the proven and promising strategies that are available. Many high-income countries have been able to reduce their rates of fatal child injuries substantially. For example, in Sweden over a 30 year period, child injury rates were brought down by more than 50%. Even if only a dozen or so of the proven strategies discussed in this report were universally implemented around the world, nearly half a million child deaths could be prevented each year – that is more than 1000 children's lives saved each day. We cannot afford to wait – the cost of doing nothing is unacceptable.

Main messages from the report

- Child injuries are a major public health issue
- Injuries directly affect child survival
- Children are more susceptible to injuries
- Child injuries can be prevented
- The cost of doing nothing is unacceptable
- Few countries have good data on child injury
- Research on child injuries is too limited
- There are too few practitioners in child injury prevention
- Child injury prevention is the responsibility of many sectors
- Child injury prevention is underfunded
- Awareness needs to be created and maintained

ANUPAMA'S STORY

Children are powerful agents of change and should be included during the development and implementation of child injury prevention projects at local, national and international levels. The following is excerpt from an essay written by sixteen-year-old Anupama Kumar of Kerala, India. She won the UNICEF Voices of the Youth road safety essay competition and received her award during the World Youth Assembly, held at the Palais des Nations of the United Nations in Geneva, Switzerland in April 2007.



© M. Kokic, WHO

"The media has been a largely overlooked factor in creating road safety awareness. Celebrity endorsements, coupled with television messages on prime-time slots and peer education programmes would provide an accessible and engaging means of promoting awareness, particularly among young people. They would convey the message that safe driving is 'cool' driving, and constantly reinforce that drunken driving, using a cell phone on the road and driving without a seat-belt (or helmet) are not only dangerous, but 'seriously unfashionable'. Celebrities could also actively encourage walking or cycling whenever and wherever possible".

Proven interventions for child injury prevention

Road safety

- ✓ Introducing (and enforcing) minimum drinking-age laws
- ✓ Setting (and enforcing) lower blood alcohol concentration limits for novice drivers and zero tolerance for offenders
- ✓ Wearing motorcycle and bicycle helmets
- ✓ Setting (and enforcing) seat-belt, child-restraint and helmet laws
- ✓ Forcing a reduction of speed around schools, residential areas, play areas
- ✓ Separating different types of road user
- ✓ Introducing (and enforcing) daytime running lights for motorcycles
- ✓ Introducing (and enforcing) graduated driver licensing systems



Drowning

- ✓ Removing (or covering) water hazards
- ✓ Requiring isolation fencing (four-sided) around swimming pools
- ✓ Wearing personal flotation devices
- ✓ Ensuring immediate resuscitation



Burns

- ✓ Setting (and enforcing) laws on smoke alarms
- ✓ Developing and implementing a standard for child-resistant lighters
- ✓ Setting (and enforcing) laws on hot tap water temperature, and educating the public
- ✓ Treating patients at a dedicated burns centre



Falls

- ✓ Implementing multifaceted community programmes such as 'Children Can't Fly'
- ✓ Redesigning nursery furniture and other products.
- ✓ Establishing playground standards for the depth of appropriate surface material, height of equipment and maintenance
- ✓ Legislating for window guards



Poisoning

- ✓ Removing the toxic agent
- ✓ Legislating for (and enforcing) child-resistant packaging of medicines and poisons
- ✓ Packaging drugs in non-lethal quantities
- ✓ Establishing poison control centres



In addition to the adoption and implementation of proven and promising child injury prevention strategies, countries also need to examine the infrastructure to support such activities. Only a few countries have good data on child injury and research on child injuries is too limited. In particular, in lower-income and middle-income countries, we need to learn what works. Child injury research is under funded everywhere and there are too few practitioners in child injury prevention to achieve what needs to be done.

Child injuries are the responsibility of many sectors and awareness and understanding of the magnitude, risk factors and preventability needs to be built and acted upon. Reducing the risk of injury for children requires the involvement and commitment of a broad range of groups including international, development and donor organizations, governments, nongovernmental organizations, the private sector, the media, teachers and community leaders, parents and children, and young people themselves. There is a role for all.

Recommendations for action

The *World report on child injury prevention* is a plea for uptake of evidence-based interventions and sustained investments by all sectors – public, private and civil – in injury prevention and control for children. It is time to actively commit to the promise of governments to address child injury and create a world where children can live, learn and play, without the risk of being killed or injured. Governments and others are encouraged to act to address the epidemic of child injury and to follow these seven recommendations when developing child injury prevention programmes.

Recommendation 1: Integrate child injury into a comprehensive approach to child health and development

A comprehensive strategy for child health and development should include all leading causes of ill health and disability among children, and therefore include injuries. Existing child survival programmes need to introduce child injury prevention strategies as part of the basic package of child health services. The current renewed emphasis on primary health-care provides an opportunity for governments, ministries of health and civil society organizations to restructure their child health programmes to include child injuries. The success of child health programmes should be measured not only by traditional measures of infectious disease mortality, but also by other indicators of fatal and non-fatal injury.

Recommendation 2: Develop and implement a child injury prevention policy and a plan of action

Each country should prepare a child injury prevention and control policy, bringing in a wide range of sectors. Agencies involved should include those concerned with transport, health, planning, consumer product safety, agriculture, education and law. There should also be representation across the disciplines, with child development experts, injury epidemiologists, engineers, urban planners, clinicians, social scientists and others all participating. Concerned groups should be brought in from government, the private sector, nongovernmental organizations, the media and the general public.

The policy should take the needs of all children into account, particularly those who are vulnerable, such as poor and homeless children and female children, and should be linked to other child health strategies. A country's child injury policy should promote the development of national standards and codes on issues that have a direct bearing on child injury, including such items as products and appliances, playground and school safety, and residential building regulations and laws.

A national strategy needs to set ambitious but realistic targets for at least five or ten years. It should have measurable outcomes and sufficient funding to develop, implement, manage, monitor and evaluate actions. Once the child injury prevention strategy is established, national and local action plans should be prepared, laying down specific actions to be taken and allocating resources for these actions.

Governments should:

- make child injuries a priority;
- identify an agency or unit to lead child injury prevention – either within the broader child health strategy or the more specific child injury prevention plan;
- appoint at least one full-time person with responsibility for injury prevention, including child injuries, in an appropriate ministry;
- establish a sustainable data collection system based on the country's needs and particular local issues related to children;
- develop a multisectoral plan of action for child injury prevention, including the setting of targets;
- coordinate activities and collaborate across sectors for the implementation and evaluation of child injury prevention programmes;
- enact, implement and enforce laws and standards that have been proven to reduce injuries;
- ensure sufficient funds and human resources for child injury prevention efforts;
- provide affordable access to all levels of health care and services for all children;
- promote the integration of health and safety concerns and an injury impact evaluation into all new projects, including those of infrastructure;
- include children and young people in the development and implementation of projects at the national and local levels.

Recommendation 3: *Implement specific actions to prevent and control child injuries*

Specific actions are needed to prevent and control child injuries and to minimize their consequences. These actions – forming a part of the national child health strategy – should be based on sound evidence, be appropriate in terms of culture and other local context, and have been tested locally. The evaluation of interventions should be an integral part of the programme.

Specific interventions for each type of injury have been discussed in some detail in the previous section of this summary as well as their impact on the frequency and severity of injuries, and their cost-effectiveness where this was known. No standard package of interventions will be suitable for all countries but the main approaches remain the same: legislation and enforcement, product modification, environmental modification, education and skills development and emergency medical care.

Remember to include children in decision-making as they can:

- act as role models by adopting safe methods to reduce injury risks – such as using safety devices and playing in safe locations;
- promote injury prevention among peers and family;
- refrain from engaging in high-risk behaviours;
- contribute to determining priorities for action;
- become involved in injury prevention campaigns and programmes.

Recommendation 4: *Strengthen health systems to address child injuries*

The health system as a whole should be strengthened to provide high quality care to injured children, as well as rehabilitation and support services. These improvements should include the development and maintenance of an efficient system of pre-hospital care; good quality acute management of injured children in hospitals and clinics, with appropriate child-specific equipment and drugs; suitable rehabilitation programmes, addressing both the physical and psychological long-term consequences of injuries; and coordination with allied sectors to ensure holistic care and management of the injured child.

The health system should also be strengthened to provide financial protection and social support to the families and households of injured children. If this is not done, households may be pushed into poverty as a result of child injuries, especially in poorer countries.

Appropriate training programmes should be a priority. Many countries do not have sufficient personnel with the skills and experience needed to develop and implement an effective child injury prevention programme.

Governments should start this process by designating a focal person or coordinator for child injury prevention within the health ministry. The particular organizational model to be used may depend on the national situation, but it is important that accountability for child injury prevention and control is explicitly set out.

Recommendation 5: *Enhance the quality and quantity of data for child injury prevention*

An important element in dealing with child injuries is ascertaining the magnitude and characteristics of the problem, as well as assessing national policies on child injury and the capacity to handle such injuries. A thorough understanding is needed, not only of the volume of child injury deaths, non-fatal injuries and disabilities, but also of the children who are most affected; the types of injury that are most prevalent; the geographic areas where the greatest problems are found; the particular risk factors; and the child health policies, programmes and specific injury interventions that are in place. In addition to this, standardized definitions are needed that are used across countries, not only for injuries but for disability as well.

Sources of data can differ depending on the type of injury. Road traffic injury data, for instance, may be obtained from police, health ministry and health-care settings, and transport ministries. Data on falls, on the other hand, may be obtained from injury surveillance systems, community-based surveys and paediatric admission records. In any case, the limitations of these sources data and their potential to influence what needs to be observed, should be considered before making use of them.

Information systems on child injuries should be simple and cost-effective to implement, appropriate to the levels of skill of the staff using them, and consistent with national and international standards (including external cause coding). Where possible, these systems should be integrated into other child health information systems, such as demographic and health surveys, integrated management of childhood disease surveys and verbal autopsy studies. Data should be widely shared among the relevant authorities and concerned groups, particularly those responsible for child health, education and social services, such as child development agencies.

There is scant data on the economic impact of child injuries in most countries, though it is known that the impact is substantial. There are also no studies on the cost-effectiveness of prevention interventions. Assessing the direct and indirect economic costs, where this is possible, as well as the proportion of gross national product attributable to child injuries, can help increase awareness of the scale of the problem.

Recommendation 6: Define priorities for research, and support research on the causes, consequences, costs and prevention of child injuries

A research agenda for child injuries should be developed at regional and national levels. The agenda should be based on evidence from a broad range of sectors. Research in all the main areas related to child injury should be strengthened, including economic analyses of both the cost of child injuries and the cost of interventions, large-scale intervention trials, especially in poorer countries, non-fatal outcomes of injury and disability, and how best to integrate injury interventions into child health programmes.

Research, if it is to be successful, requires focused investments in human and technical capacity, particularly in low-income and middle-income countries. A critical mass of trained researchers on injuries and their prevention needs to be built up. Research skills should be strengthened in a range of disciplines, including those of epidemiology, clinical trials, economics, engineering, sociology, behavioural and developmental psychology, product evaluation, and policy analysis.

Recommendation 7: Raise awareness of and target investments towards child injury prevention

The reality that child injuries are predictable and preventable is often not understood, by the lay public and also by policy-makers, medical personnel and donors. It is vital, therefore, that awareness is created about the fact that these injuries can generally be prevented. It is an enormous advantage if well-known personalities or political leaders can actively champion the cause of child injury prevention. In addition, an active civil society movement for child injury prevention, grassroots local organizations for child safety, and sensitive and responsible media reports can all bring about the necessary cultural changes in society.

International conferences, furthermore, provide opportunities to exchange knowledge and establish networks and partnerships. Complementary strategies, such as introducing child injury prevention into school and university curricula, can also help sensitize young people to the risk of child injuries.

Well-targeted financial investments can reduce child injuries and deaths considerably. Assessing the costs against the benefits of specific interventions and setting priorities accordingly is important for all countries. International nongovernmental organizations and large corporations can help raise awareness at the global and national level, as can – at the local level – socially aware employers and ordinary committed citizens.

Teachers and community leaders should:

- teach injury prevention at school from a young age;
- ensure that schools, playgrounds, and the access to schools are all safe;
- set up and maintain safe public places and safe sports and recreational facilities;
- promote injury prevention at universities and integrate the topic into existing professional programmes;
- foster research into child injury prevention in educational settings;
- include children and youth when implementing interventions for child injury at a community level.

Journalists and reporters can help raise the profile of child injury prevention by:

- studying child injuries and working to prevent them;
- reporting responsibly, accurately and sensitively the traumatic consequences of injuries – with information on prevention *always* included in reports;
- promoting child injury prevention by featuring stories of young survivors and their families, highlighting good practices in injury prevention;
- featuring safe practices in radio and television dramas, and other broadcast programmes;
- initiating or supporting child injury prevention campaigns.

International, development and donor organizations should make – in a highly visible way – child injury prevention a priority at an international level; fund and promote research, interventions and evaluations on child injury prevention; encourage governments to take sustainable action on child injury prevention; and support capacity-building efforts.

Conclusion

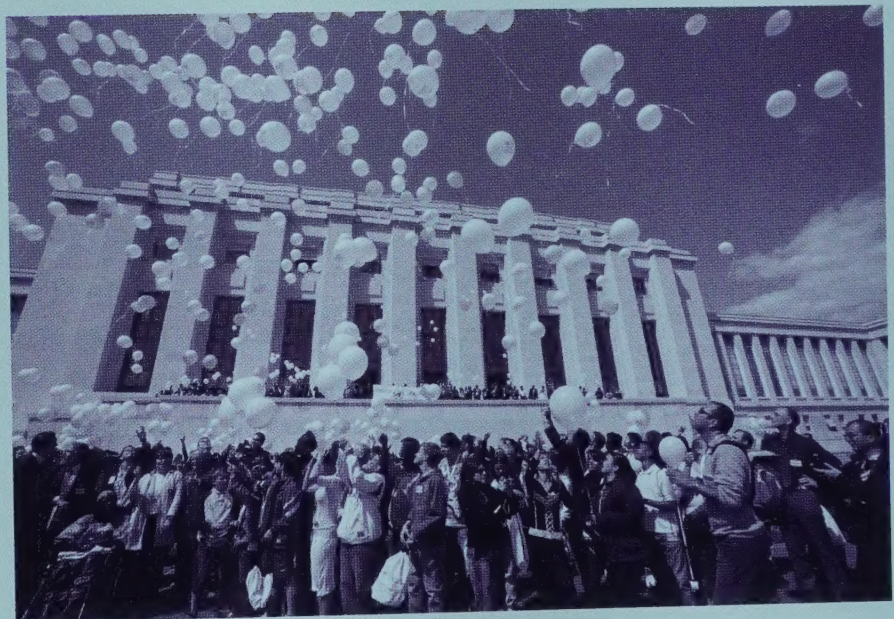
The commitment to reduce the burden of childhood diseases has been proclaimed by international and national declarations. All the same, high levels of childhood mortality, morbidity and disability persist. A principal reason for this is the impact of childhood injuries, affecting children of all ages.

The global community has the knowledge, an armoury of interventions and the resources to prevent this loss of healthy life in the youngest members of our community. This report is a plea for evidence-based interventions and sustained investments by all sectors – public, private and civil – in injury prevention and control for children. It is time to unleash the promise of governments and create a world where children can learn, play, grow up and live without being killed or injured.

Youth Declaration for Road Safety

The first ever *World Youth Assembly for Road Safety* was held at the United Nations in Geneva, Switzerland in April 2007. Nearly 400 delegates from over 100 countries met to share experiences and ideas and identify ways to strengthen road safety efforts in their home countries. The two-day event was organized and led by young people. It culminated in the adoption of a Youth Declaration for Road Safety which was handed to the President of the United Nations General Assembly.

In an additional, moving tribute to victims of road traffic crashes, the delegates gathered on the steps of the Palais des Nations and released white balloons. As she released her balloon, Yomna Safwat from Egypt dedicated hers to her young brother killed in a road crash, saying "These balloons as many as they are, are without question outnumbered by the tears shed over loved ones needlessly lost on the road. In tribute to these young souls, each balloon is a cry out to the world to take action, to save the youth and to prevent road deaths and injuries. I send my balloon to my dear brother, Mohammed Karim, with a message that your life has not been lost in vain, but will fuel the efforts of the youth all around the world to make roads safer."



© M. Koric, WHO



IMPLEMENTING PROVEN CHILD INJURY prevention interventions could save more than a thousand children's lives a day.

— Dr Margaret Chan,
Director-General, WHO
and Mrs Ann Veneman,
Executive Director, UNICEF